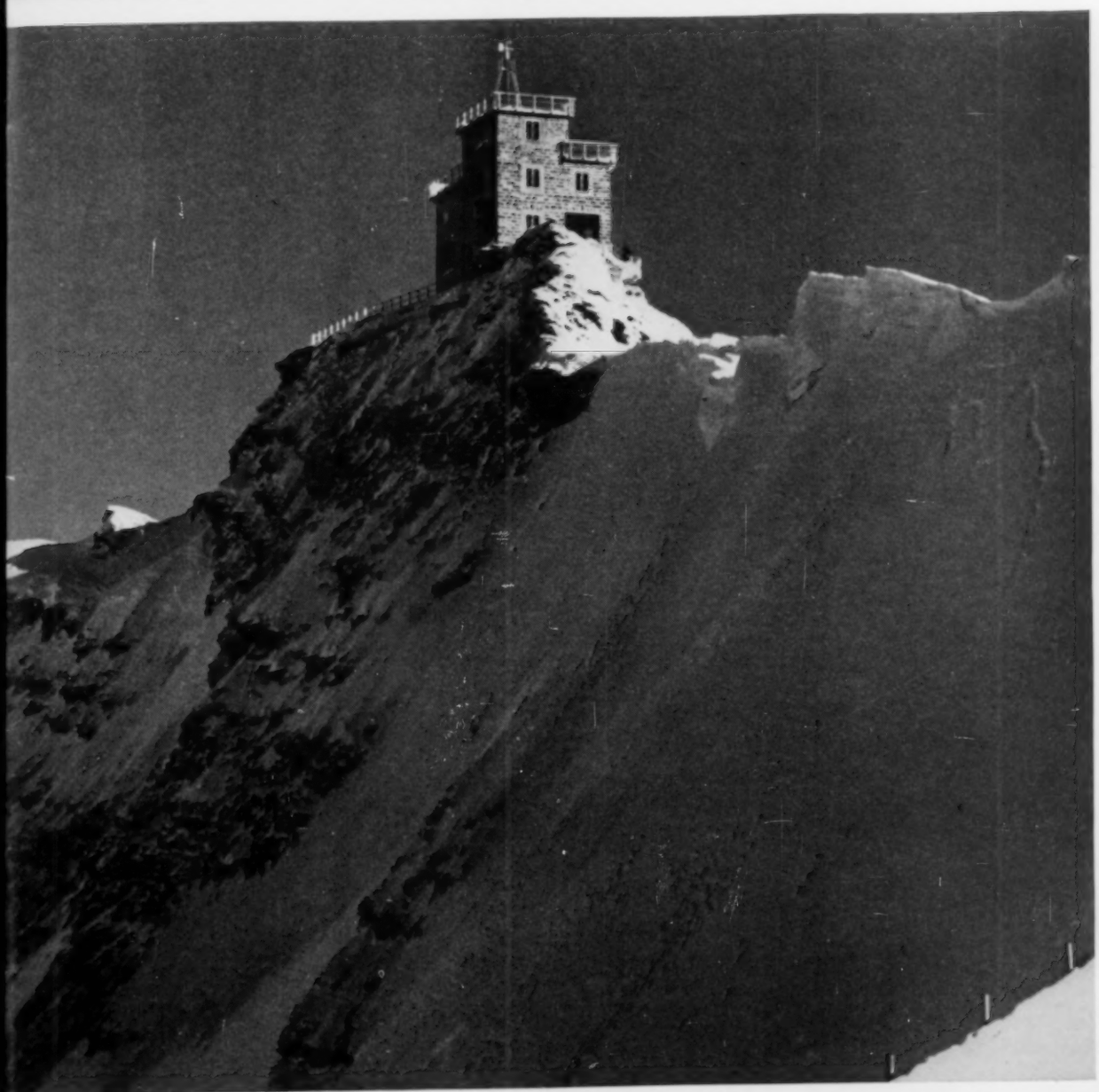
Compressed Air Magazine

JANUARY 1946

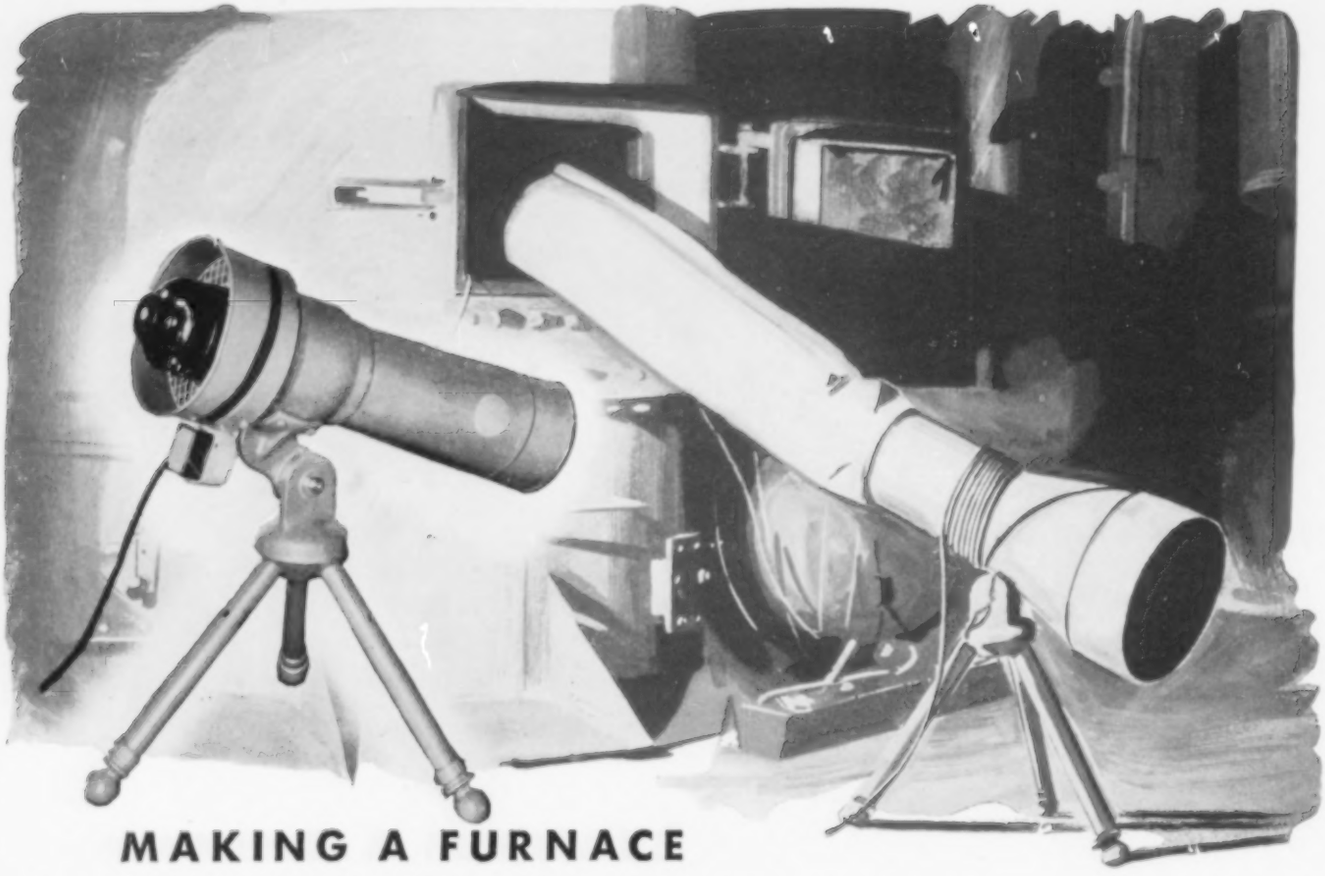


OBSERVATORY ON ALPINE SUMMIT

Swiss Station for Weather Research is Served by Interior Elevator.

VOLUME 51 • NUMBER 1

NEW YORK • LONDON



MAKING A FURNACE A BETTER PLACE TO LIVE IN

When a furnace or anything in a confined space needs attention, a Coppus Blower will make the interior livable in a short while, reducing down time.

From the Coppus "Blue Ribbon" line of blowers and exhausters, you can find exactly the right ones to help you save time and improve working efficiency on jobs where confined spaces must be cleared of fumes or foul air . . . where heat exhaustion threatens . . . where equipment or material in process needs to be dried. There are Boiler Manhole Blowers and Exhausters, Cable Manhole and Tank Ventilators, Shiphold Ventilators, Heat Killers and other types—all designed to put the right amount of air where you want it, at lowest cost.

The blue band painted around each Coppus product signifies "Blue Ribbon" materials and workmanship, promising you long trouble-free service despite the severe usage such portable equipment gets.

For specific information check and mail the coupon.

ANOTHER
COPPUS
"BLUE RIBBON" PRODUCT

Address Coppus Engineering Corporation, 441 Park Avenue, Worcester 2, Mass. Sales Offices in THOMAS' REGISTER. Other "Blue Ribbon" Products in SWEET'S CATALOG, CHEMICAL ENGINEERING CATALOG, REFINERY CATALOG.

COPPUS ENGINEERING CORP., 441 PARK AVENUE, WORCESTER 2, MASS.
Please send information on how to plug Man-Hour Losses with air.

- ☐ in tanks, tank cars, drums, etc.
- ☐ in underground cable manholes.
- ☐ in aeroplane fusilages, wings, etc.
- ☐ on coke ovens.
- ☐ on steam-heated rubber processes.
- ☐ on boiler repair jobs.

COOLING:

- ☐ motors, generators, switchboards.
- ☐ wires and sheets.
- ☐ general man cooling.
- ☐ around cracking stills.
- ☐ exhausting, welding fumes.
- ☐ stirring up stagnant air wherever men are working or material is drying.

NAME.....

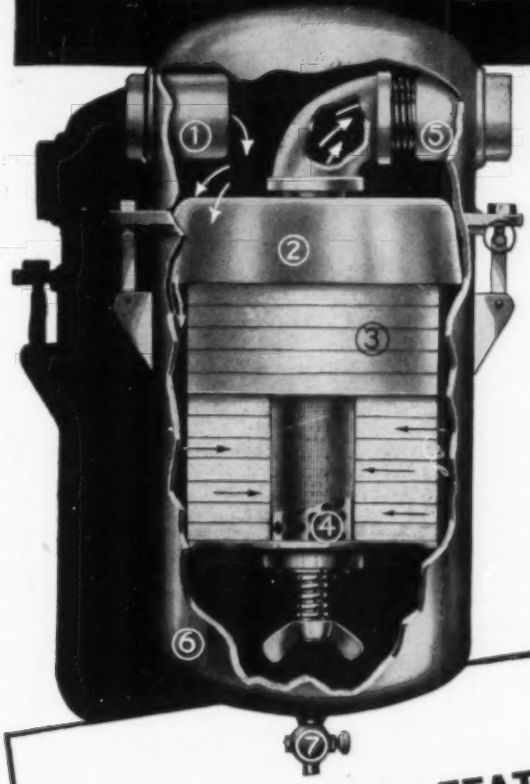
COMPANY.....

ADDRESS.....

CITY.....

(Write here any special ventilating problem you may have).

HAZARD of Oil and Moisture in Automatic Controls NOW ELIMINATED



New Filter Delivers Dry Air Only

Amazing results are being reported by users of the Model AAPHS Pipe Line Filter as a final stage in the protection of delicate pneumatic control instruments.

Typical comment is that of a large producer of electric and steam power who says, "We tried several well-known methods of moisture and oil elimination without satisfactory results. Your Model AAPHS was finally installed in the air line and since then we have had no trouble whatever with oil or moisture in our automatic controls."

NEW 44-PAGE CATALOG: Describes entire line, including filters for building ventilation, pipe lines, engine, and compressor intakes. Your copy is ready.

CONSTRUCTION FEATURES

(1) inlet; (2) baffle that distributes vapor-laden air to sides of container (6); (3) felt rings; (4) perforated liner; (5) outlet; (7) drain cock; (8) swing bolts for easy inspection (optional).

THICK FELT RINGS that remove every trace of oil or moisture.

SPECIFICATIONS

Model	Standard Pipe Size	Capacity
AAPH-02 AAPHS-02	¼"	5 CFM
AAPH-01 AAPHS-01	⅜"	7 CFM
AAPH-0 AAPHS-0	½"	10 CFM
AAPH-1 AAPHS-1	¾"	20 CFM
AAPH-2 AAPHS-2	1"	30 CFM
AAPH-4 AAPHS-4	1½"	50 CFM
AAPH-5 AAPHS-5	2"	100 CFM

Letter S in code numbers indicates swing-bolt type which facilitates inspection.

Write for Bulletin "A"

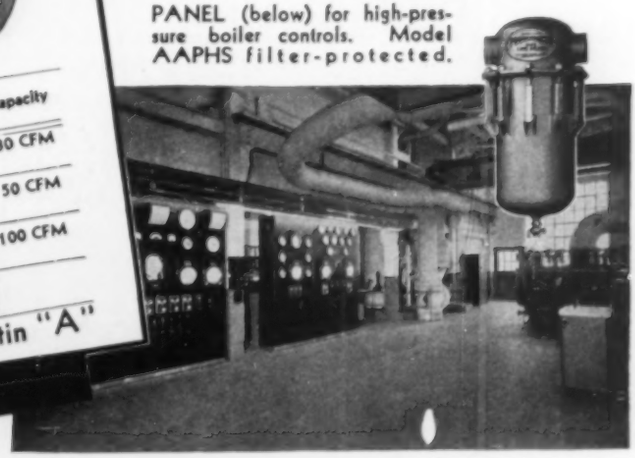
DOLLINGER CORPORATION

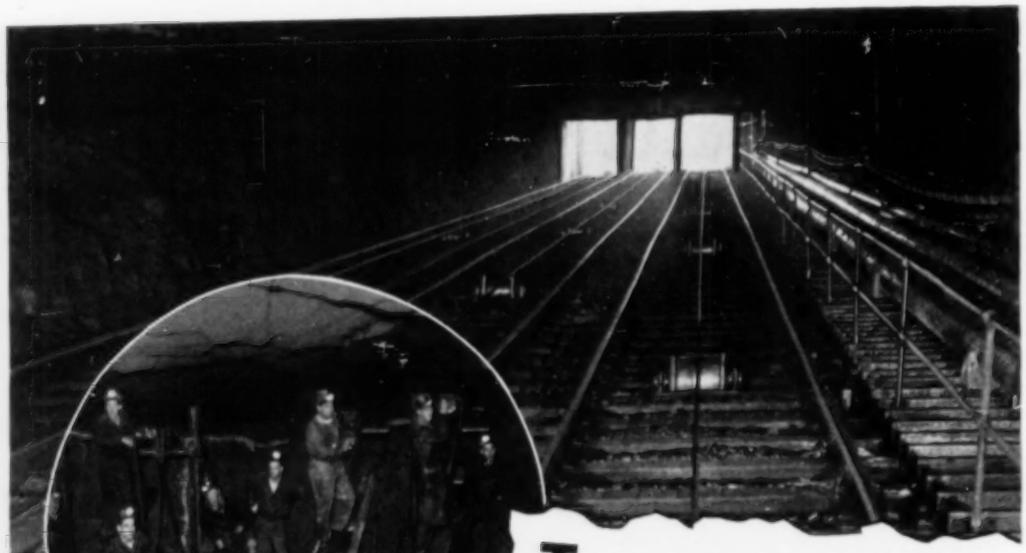
7 CENTRE PARK, ROCHESTER 3, N. Y.

"Air Filter Headquarters"

STAYNEW PROTECTO-MOTOR FILTERS

PANEL (below) for high-pressure boiler controls. Model AAPHS filter-protected.



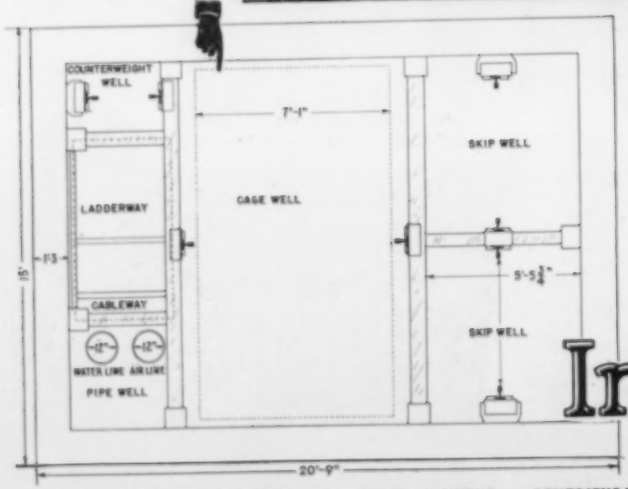


Main inclined shaft at a magnetite mine. Slope 33 degrees, height 9 feet 8 inches, width 28 feet 2 inches, and length 2000 feet. It will handle 8000 long tons of ore per day.

Insert shows DA-35 Power-Feed Drifters at work. Jackbits were used for all drilling. They were reconditioned with the JMA hot-mill and were reduced 1/16 inch in gauge.

DA-35 Drifters in the New Leonard Shaft of the Warren Foundry and Pipe Co.'s Mt. Hope mine. I-R Jackhamers were used in place of the drifters whenever the rock was soft.

Cross section of the New Leonard Shaft. Total depth of this shaft is 2674 feet, and it will handle at least 6000 tons of ore per day. Jackbits were used for shaft sinking and for drilling bolt holes in the concrete for the steelwork that divides the shaft.



Two of the largest shafts east of the Mississippi sunk with I-R Rock Drills and Jackbits

FAST DRILLING IS ESSENTIAL if the overall shaft-sinking time cycle is to be reduced. That is why the contractors on these two shaft jobs selected record-breaking DA-35 Power-Feed Drifters to do their drilling.

The Power Feed was specified because it provides faster steel changes. It gives the drill operator greater freedom and he is less fatigued at the end of the shift. There is no let-down in the rate of drilling. Forty different positions of the Power-Feed throttle permit the proper adjustment for any kind of rock.

Jackbits were used on both jobs since they enable drill runners to get the most out of their machines. Less steel was handled, and the proper design of bit for the local rock conditions was chosen from the wide range of Jackbit types and sizes.

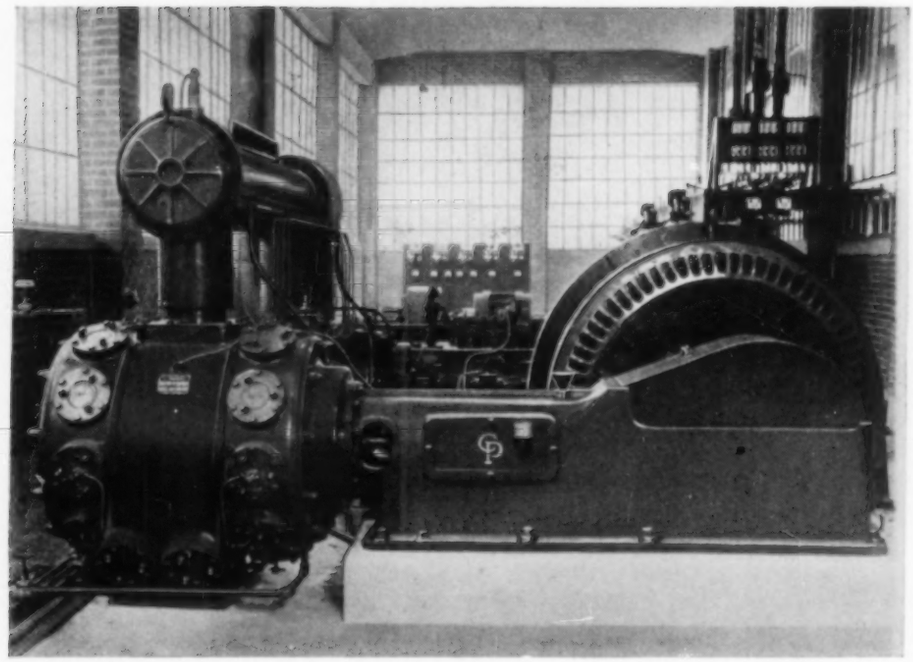
Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y. 5-733

COMPRESSORS · CONDENSERS · TURBO BLOWERS · CENTRIFUGAL PUMPS · ROCK DRILLS · AIR TOOLS · OIL AND GAS ENGINES

IMPROVED LUBRICATION

ASSURES TROUBLE-FREE AIR COMPRESSOR OPERATION



NO HARD CARBON DEPOSITS

WIDE-OPENING, TIGHT-SHUTTING VALVES

NO RING STICKING

PORTS OPEN AIR LINES CLEAR

YOU can get *all* these benefits by using today's *Texaco Alcaid, Algol or Ursa Oil.* Operators everywhere find these improved lubricants assure fewer repairs and replacements, longer periods between overhauls, *better performance at lower cost!*

Texaco Alcaid, Algol and Ursa Oils have been steadily improved through the years. They are made from crudes especially selected for their lubricating value, wholly distilled, and processed by modern Texaco methods in one of the world's largest refineries.

There is a right grade of *Texaco . . . Alcaid, Algol or Ursa Oil . . .* for every air compressor requirement. The high quality and dependable uniformity of these fine oils are known and relied on in all parts of the world. For effective and economical operation, use them in *your* compressors.

Call on Texaco Lubrication Engineering Service for help on all your lubricating problems. Just contact the nearest of the more than 2300 Texaco distributing plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

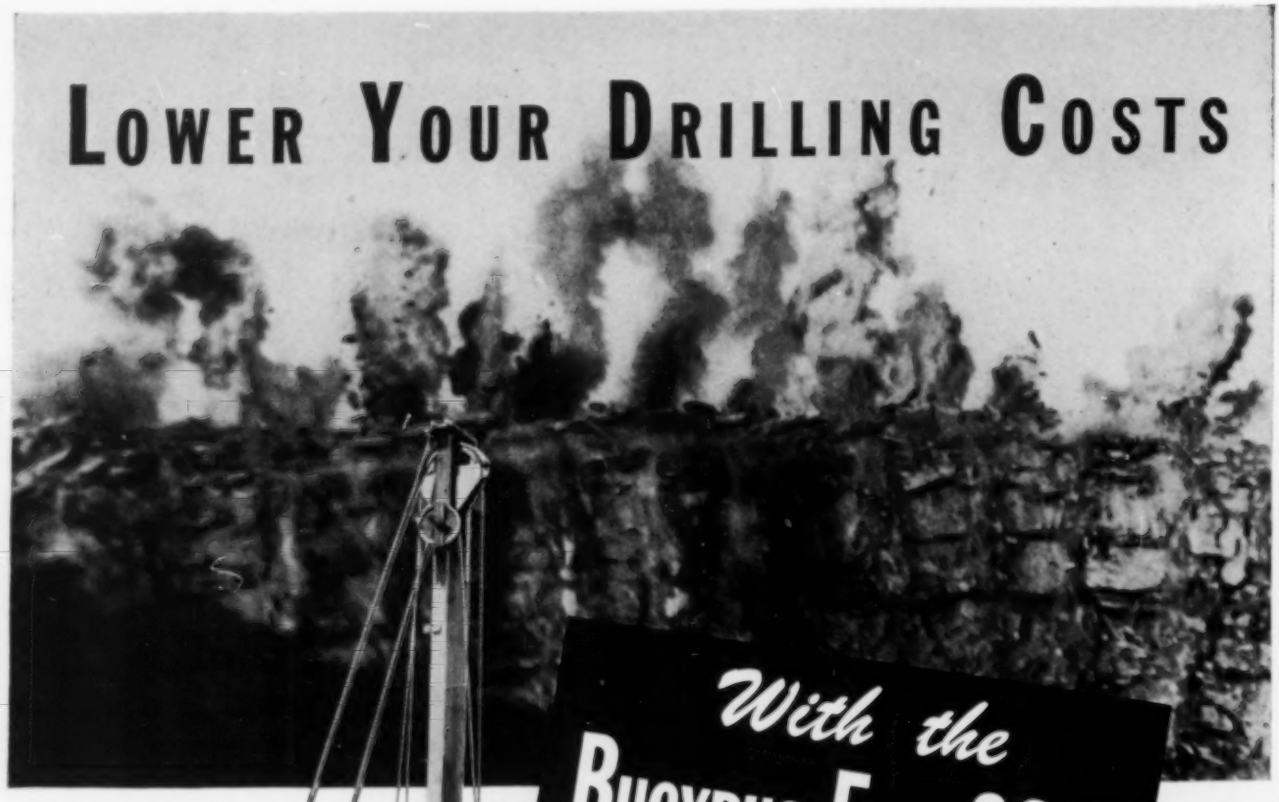
TEXACO

TEXACO Lubricants

FOR ALL AIR COMPRESSORS AND TOOLS

TUNE IN THE TEXACO STAR THEATRE WITH JAMES MELTON SUNDAY NIGHTS ★ METROPOLITAN OPERA BROADCASTS SATURDAY AFTERNOONS

LOWER YOUR DRILLING COSTS



With the BUCYRUS-ERIE 22-T

Here's a blast hole drill that combines the advantages of larger machines with such rock-bottom economy that it's the machine you need for low cost drilling in small and medium-sized quarries, cement plants, construction projects.

The same shattering blows, speedy drilling, easy operation, mobility, and rope economy that have long characterized larger Bucyrus-Erie drills are yours with the 22-T. Self-propelling, it's thoroughly modern in design, all-steel in construction. With ample capacity to put down 6-inch or 6⅝-inch holes 100 feet or over, it gives you the profits that result from having a unit that's **right** for the job.

Try the 22-T on your work. The same features which have made Bucyrus-Erie first choice in large quarry and mining operations all over the world, will demonstrate the 22-T's ability to cut your drilling costs and increase your profits.

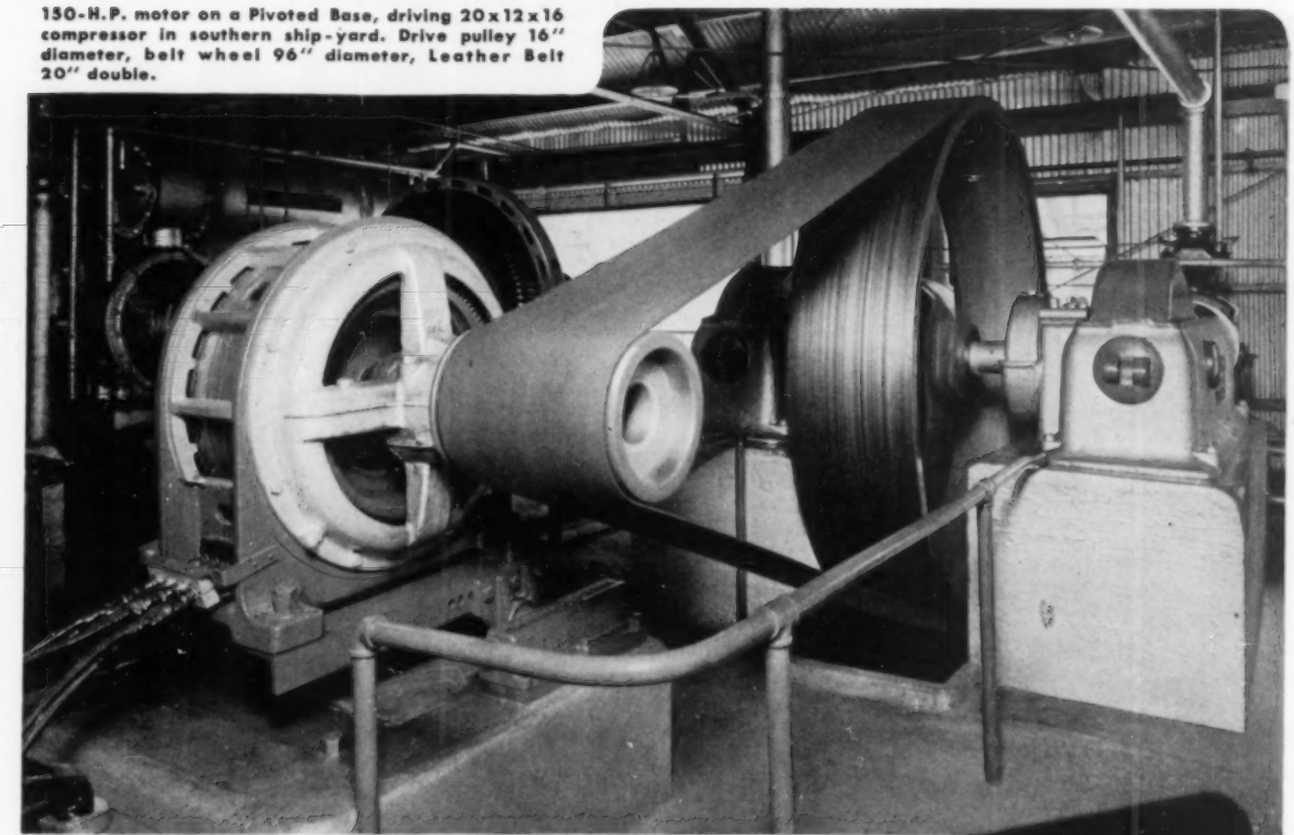
H-50C

BUCYRUS ERIE

SOUTH MILWAUKEE WISCONSIN

Leather Belting
DOES THIS JOB BEST

150-H.P. motor on a Pivoted Base, driving 20 x 12 x 16 compressor in southern ship-yard. Drive pulley 16" diameter, belt wheel 96" diameter, Leather Belt 20" double.



For your new compressors, pick the drive that gives you the longest, most trouble-free, economical service. Before you specify, get the full story on flat leather belting. And don't overlook the *natural* advantages of leather.

Consider especially the proved advantages of the pivoted motor-base in reducing maintenance by automatically preserving proper belt tension.

Leather Belting is the first choice of design- and plant-engineers for both long- and short-center compressor drives.

To keep compressors going longer—without interruptions—and at maximum output—leave it to leather.

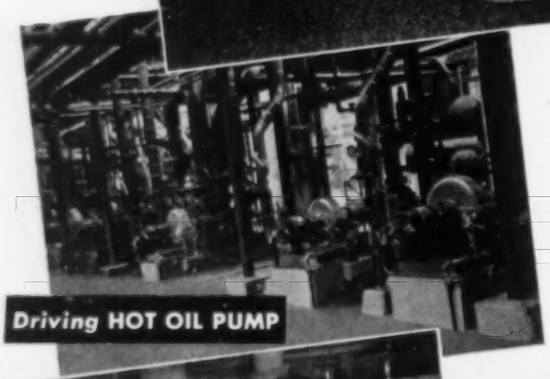
ENGINEERS AGREE . . . that continuous, trouble-free power-transmission demands the advantages of the Short-Center, Flat Leather-Belt Pivoted Motor-Base Drive.

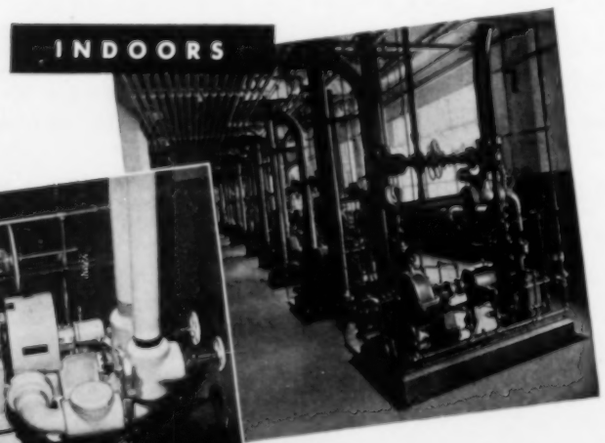
Leave it to Leather!

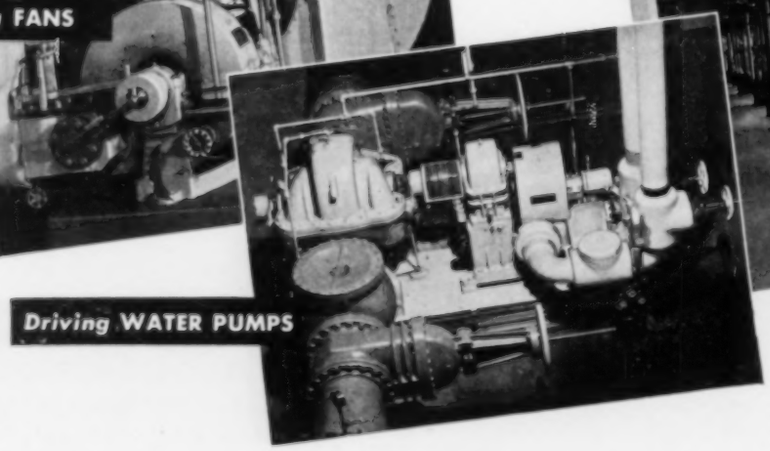
AMERICAN LEATHER BELTING ASSOCIATION · 41 Park Row, NEW YORK 7, N. Y.

GOOD —wherever you put them—

TURBINES by ELLIOTT







are handling responsible drive jobs in so many tough spots, in such a wide diversity of applications, with such a high degree of success and satisfaction, that their reliability and general value are no longer a matter of question.

If you need turbines that require a minimum of maintenance, that will stand up in continuous service, that will operate dependably anywhere—talk it over with the Elliott turbine engineer or write for the Turbine Bulletin.

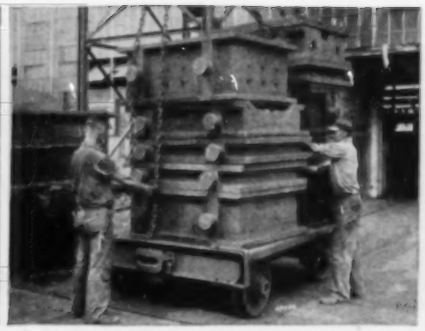
ELLIOTT COMPANY

Steam Turbine Dept., **JEANNETTE, PA.**

Plants at: JEANNETTE, PA • RIDGWAY, PA.
SPRINGFIELD, OHIO • NEWARK, N. J.
DISTRICT OFFICES IN PRINCIPAL CITIES

H-696

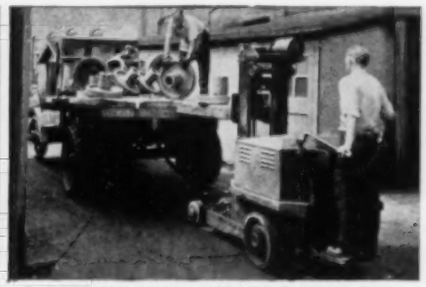
1. EASTON TIER-LIFT ELECTRIC PLATFORM TRUCK



2. EASTON 20-TON CAR HANDLING FOUNDRY MOLDS

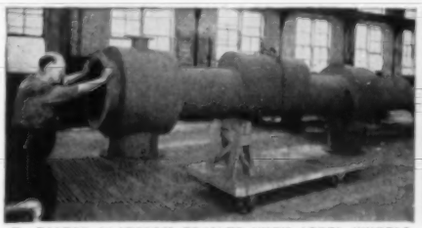
3. EASTON SPECIAL LARGE CAPACITY CORE-OVEN CAR

4. EASTON 2-TON RUBBER-TIRED PLATFORM TRAILER



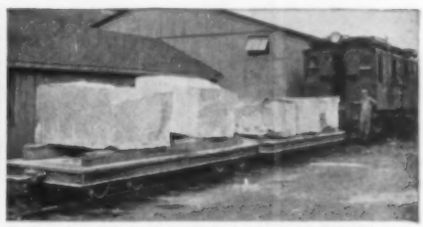
5. A VETERAN EASTON TIER-LIFT ELECTRIC TRUCK

6. EASTON RUBBER-TIRED STOCKROOM TRAILER



7. EASTON PLATFORM TRAILER WITH STEEL WHEELS

8. EASTON LOW-LIFT TRUCK PUSHING PLATFORM CAR



9. TWO EASTON 40-TON DOUBLE-TRUCK PLATFORM CARS

10. EASTON LOW-LIFT ELECTRIC PLATFORM TRUCK

11. EASTON 5-TON PLATFORM CAR, TIMKEN BEARINGS

12. EASTON OPEN FRAME TRAILER, 5000 LBS. CAPACITY

AN INTEGRATED ENGINEERING SERVICE TO MEET YOUR HANDLING PROBLEMS . . .

ALL of these EASTON-engineered electric lift trucks, industrial cars and trailers are serving *one* manufacturing plant. The complexity of light and heavy, routine and highly specialized handling and production operations helps to illustrate the scope of EASTON's integrated engineering service. Plant managers and engineers who are faced with a similar variety of flow and handling problems find it convenient and helpful to refer their questions to

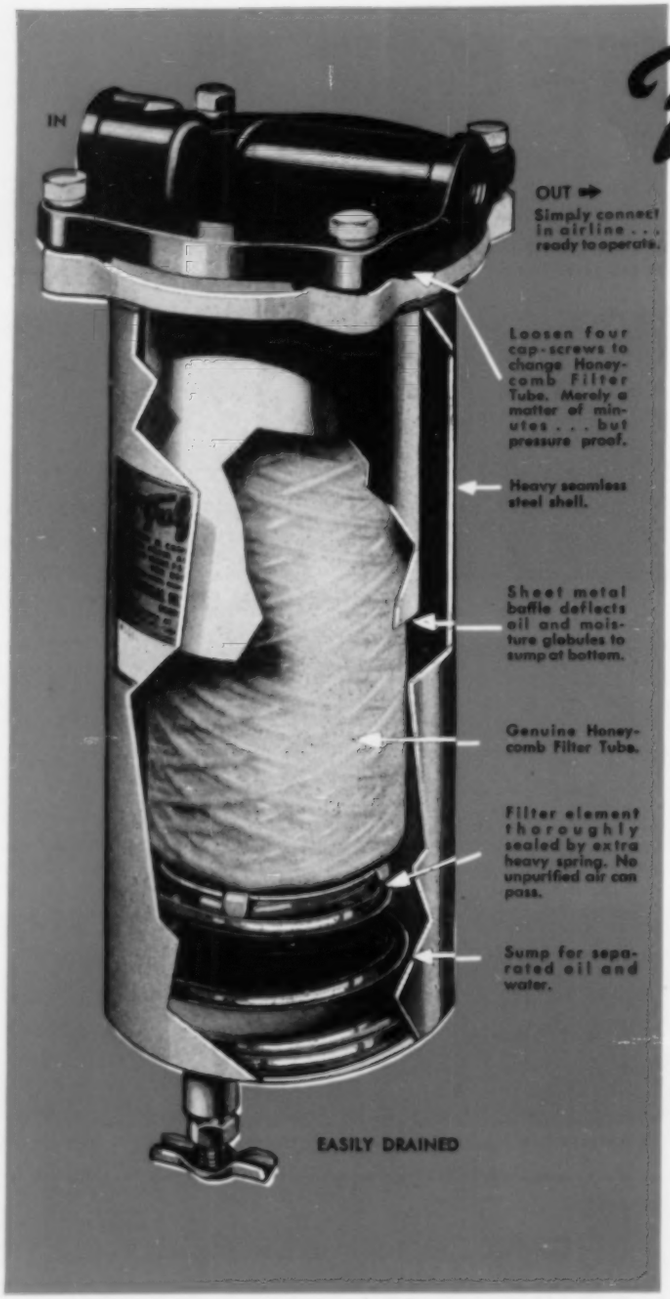
Engineering Counsel, Easton Car & Construction Co., Easton, Pa.

EASTON

TRAILERS · TRUCK BODIES
CARS · ELECTRIC TRUCKS

ENGINEERED

A-1009


IN
OUT ➡
Simply connect in airline . . . ready to operate.
Loosen four cap-screws to change Honeycomb Filter Tube. Merely a matter of minutes . . . but pressure proof.
Heavy seamless steel shell.
Sheet metal baffle deflects oil and moisture globules to sump at bottom.
Genuine Honeycomb Filter Tube.
Filter element thoroughly sealed by extra heavy spring. No unpurified air can pass.
Sump for separated oil and water.
EASILY DRAINED

Fulflo FILTERS

FOR CLEAN COMPRESSED AIR

REMOVE DIRT, SCALE, MOISTURE AND OIL EFFICIENTLY AND ECONOMICALLY

The outstanding efficiency of Fulflo Filters is due to the unique construction of their genuine Honeycomb Filter Tubes. These tubes are made by winding soft strong cotton yarn on a metal screen core in such a manner as to form hundreds of diamond shaped filtering tunnels. Across these tunnels at every layer of yarn there is drawn a fine film of cotton fibres with both ends locked firmly in place. Fineness of filtration can be predetermined by varying the size of the diamond shaped tunnels.

Honeycomb Filter Tubes are mounted in their container in such a manner that all air must pass through the diamond shaped fine filtering webs. Locked ends of fibres permit no rupturing, channelling or by-passing under severest operating conditions.

Oil and water are rejected and thrown to sump for removal by simple daily drainage.

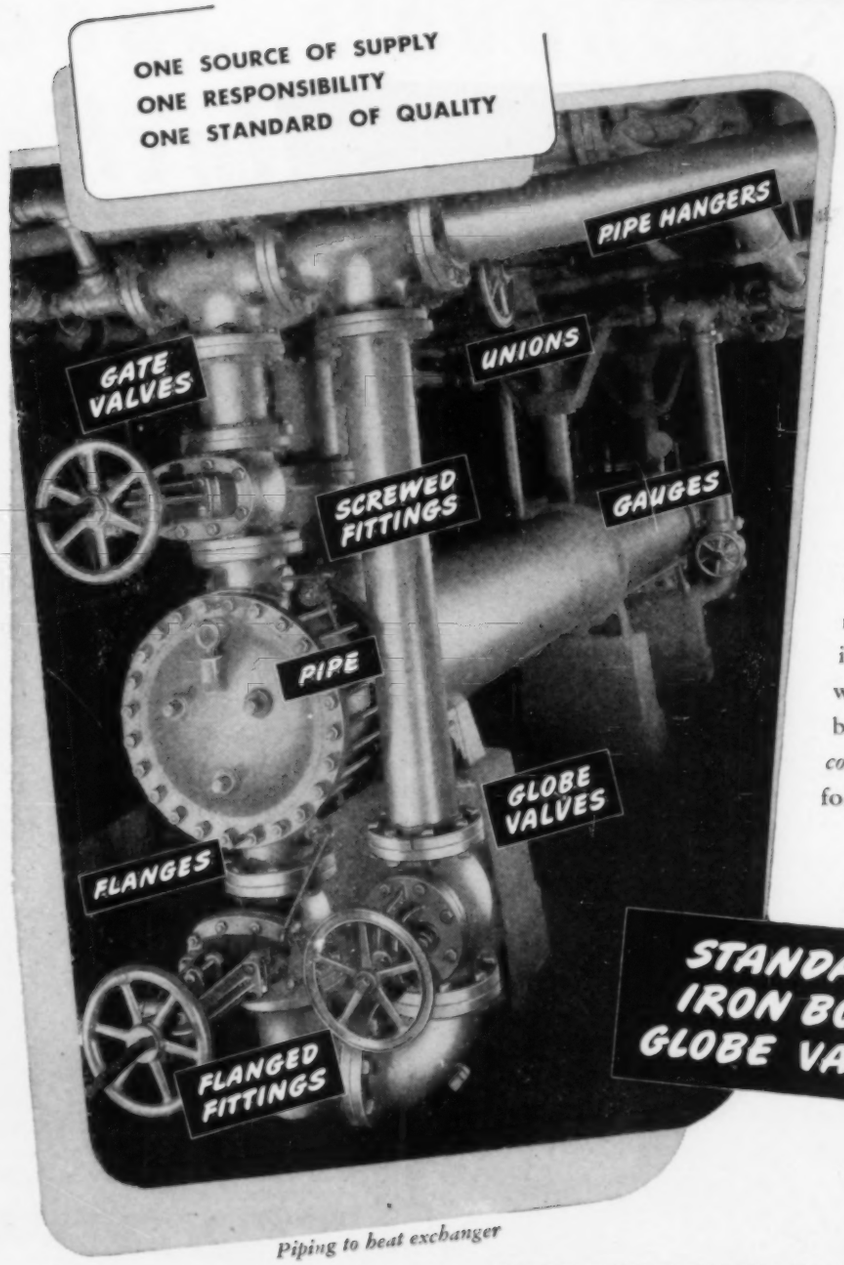
Genuine Honeycomb Filter Tubes separate suspended solids down to microscopic size. A fraction of a thousandth of an inch – too tiny for the eye to see. Fulflo-filtered air is microscopically clean. Honeycomb Tubes are low-priced, long-lasting, easily renewed. Write today for illustrated folder.

Above illustrated filter is for mounting directly on the airline. Base-mounted filters of considerably larger sizes are available.

Commercial Filters Corporation

DEPT. C • A AND WEST THIRD STREETS • BOSTON 27 • MASS.

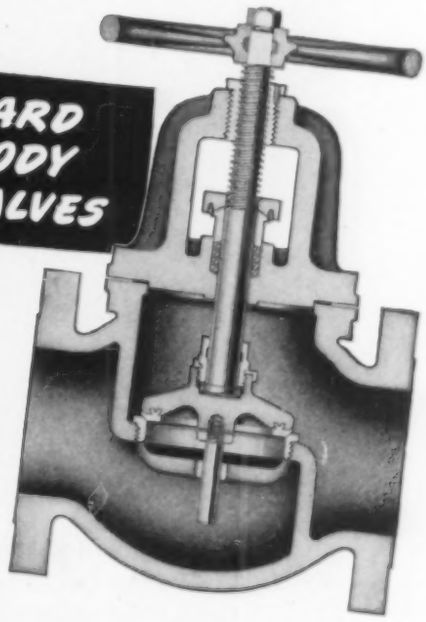
For "User's Choice" of Piping Materials ...it's the Complete CRANE Line



Piping to heat exchanger

Piping systems operate under varying conditions. What conditions should dictate your choice of piping materials, you can best determine. Then Crane helps you meet those specific requirements with the world's largest line of valves, fittings, pipe and piping accessories for all applications. By demonstrating the merits of all types of materials, Crane, with 90 years' experience, enables you to choose correctly for every need.

Ordering from the Crane line simplifies all piping jobs. Your Crane branch or Wholesaler supplies all materials. You're sure to get a better installation and better performance with all parts of uniform quality, backed by single responsibility. This *complete* Crane service is *made-to-order* for your peacetime program.



SERVICE RECOMMENDATIONS:

Crane Standard Iron Body Globe and Angle Valves meet all general service requirements with working pressures up to 125 pounds steam. Brass-trimmed valves are recommended for steam, water, and fluids non-corrosive to brass or iron; all-iron valves for fluids that corrode brass but not iron. Also available with choice of composition discs for steam, hot water, cold water, air, oil, and other services. In sizes from 2 in. up—with screwed or flanged ends. Crane also makes iron body globe and angle valves in all-iron; with brass trim; and with composition disc; in sizes from ¼ to 2 in. Rated at 150 pounds steam, 250 pounds cold. See your Crane catalog, pages 143 to 151.

CRANE CO., General Offices: 836 S. Michigan Ave., Chicago 5, Ill. • *Branches and Wholesalers Serving All Industrial Areas*

CRANE

VALVES • FITTINGS • PIPE
PLUMBING • HEATING • PUMPS

RockerShovels Speed Incline

RockerShovel operating on 32 per cent (18°) grade mucks out heading in West Virginia mine.

Advance heading 300% faster

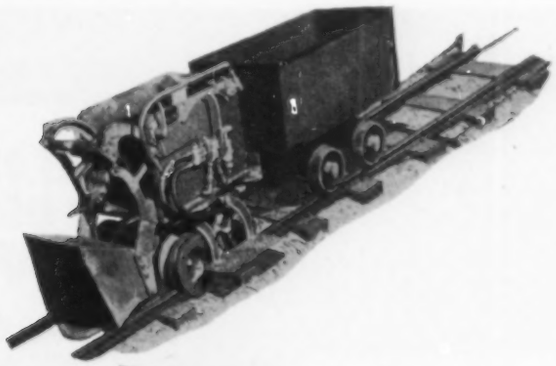
Incline shaft sinking is being completed more rapidly than ever before thru the use of the Eimco RockerShovel with its new patented snubber.

This device may be purchased for use on RockerShovels or may be installed on new machines at the factory. With the snubber attachment, the RockerShovel operates on grades up to 45% as if it were on level track—full tractive power, no track jumping, maximum bucket loads, and no special cars.

The following quotation from a field report on a snubber installation in West Virginia where the grade is 32%, describes the "full tractive power" of the RockerShovel on grades.

". . . This loader works perfectly on this slope, 32%, and nothing is lacking in the way of power

A106



Shaft Sinking

for movement up and down the track. It is possible to move the loader with a loaded car upgrade, and it is good to have this power when the car is lowered too far . . ."

Another mine used the RockerShovel on a 43% grade. The shaft was sunk 240 feet in record time. Crews of three men drilled, blasted, and mucked out on each shift. An average advance of 6 feet per shift was made, compared with less than 2 feet advance per shift by hand mucking.

Let the RockerShovel help speed your development. On inclines or level ground the Eimco RockerShovel loads faster, better, cheaper—we guarantee it! Write for information.

Eimco RockerShovel

EIMCO

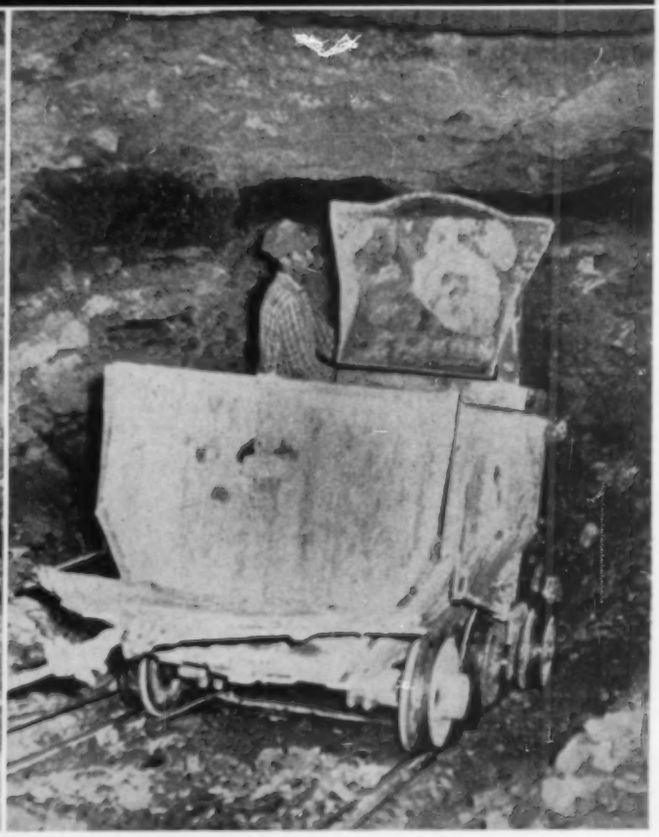
THE EIMCO CORPORATION

The World's Largest Manufacturer of Underground Rock Loading Machines

Executive Offices and Factories: Salt Lake City 8, Utah
Branches: New York, Chicago, El Paso, Sacramento, St. Louis

Rear view of loader showing track advance method using Eimco double tread wheels and cable reels on rear axle.

View of loader dumping into car. Note full buckets. The grade is 32 per cent.



HE PULLED THE SAME GAG ON ME 20 YEARS AGO
THE OLD MAN SHOULD'VE BEEN A 1ST SGT.
WHAT DID YOU USE, TISSUE PAPER?
HE SURE BURNS UP WHEN THEY DON'T USE RAINBOW
WAIT UNTIL HE GETS TO THE PART ABOUT SABOTAGING PRODUCTION
BUT I JUST PACKED IT YESTERDAY
EVEN I KNOW RAINBOW PACKING DOES A BETTER JOB

RAINBOW–
THE ORIGINAL RED SHEET PACKING

Today, when continuous production is so vital insist on Rainbow for 100% trouble-free operation.

It is designed for packing flanges and other parallel surfaces against hot or cold water, air, saturated steam pressures up to 150 pounds, and all hydraulic conditions.

Rainbow guarantees a tight fit, fills up irregularities in the flange. Will not blow or squeeze out of flange. For dependable joints, be sure it's Rainbow—the *original* Red Sheet Packing.

Listen to "Science Looks Forward"—new series of talks by the great scientists of America—on the Philharmonic-Symphony Program, CBS network, Sunday afternoon, 3:00 to 4:30 E.S.T.

UNITED STATES RUBBER COMPANY

Serving Through Science

1230 SIXTH AVENUE • ROCKEFELLER CENTER • NEW YORK 20, NEW YORK

By fast we mean the air tool has the job finished in the shortest possible time. This, of course, requires the cooperation of the operator, but that is obtained easily because air tools are light-weight—*less fatiguing*—safe—increase his capacity and ability to do better work.

The speed and torque of air-motor tools can be varied at will. They can be started and stopped instantly, permitting quick spotting on repetitive operations.

Durability is another factor not to be overlooked when doing jobs faster. The simple sturdy design of I-R air tools assures "stick-on-the-job" performance as well as low maintenance costs.

When you need portable, hand-held tools, be sure to get I-R Air Tools.

Ways to do it

AIR TOOLS
COMPRESSORS
CONDENSERS
ROCK DRILLS
TURBO BLOWERS
CENTRIFUGAL PUMPS
OIL & GAS ENGINES

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y. 8-813

- *Insoluble*—Stays put; will not wash out
- *Seals Permanently*—Fills all clearances and imperfections
- *Lubricates threads*—Permits quick and easy tightening
- *Eliminates galling, rust*—Joints easily taken apart later
- *Never hardens*—Can't crack under vibration or strain
- *Ready for use*—Packed in 1, 5 and 7 lb. cans

John Crane Plastic Lead Seal is ONE compound for ALL general services. Use it for plant maintenance and production assembly. A test tells the full story. Write us—sample will be sent immediately.

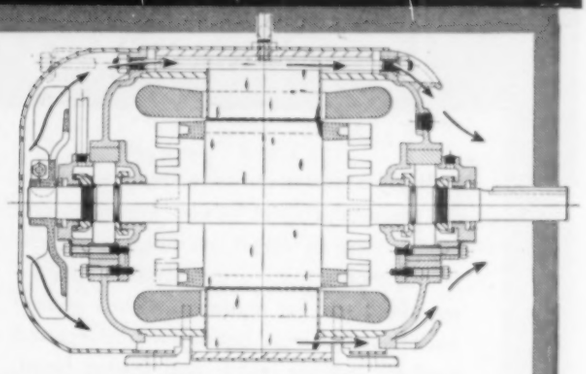
CRANE PACKING COMPANY

1808 CUYLER AVE. • CHICAGO 13, ILL.

BALTIMORE, BOSTON, BUFFALO, CLEVELAND, DALLAS, DETROIT, HOUSTON, LOS ANGELES, NEW ORLEANS, NEW YORK, PHILADELPHIA, PITTSBURGH, SAN FRANCISCO, ST. LOUIS, TULSA

CRANE PACKING CO., LTD., Hamilton, Ontario, Canada.
Branches: Montreal, Toronto, Vancouver

Maintenance Costs Go Down and Costly Shutdowns Are Avoided When This Wagner Two-Frame Motor is Put on the Job

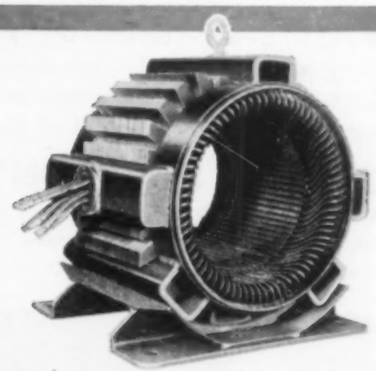


The Wagner type CP totally-enclosed fan-cooled motor has two frames: an outer frame that guides a strong cooling draft over the motor, and an inner frame completely sealed against the entrance of dust, fumes, or moisture into the vital parts of the motor.

The cost of maintaining open-type motors is likely to be excessive when dust, fumes, or moisture are present. Abrasive, conductive, or explosive dust, corrosive gases or fumes, steam and moisture are destructive to motors and cause frequent motor shutdowns for cleaning and repairing. The way to avoid excessive motor maintenance and production losses during motor shutdowns is to use Wagner type CP totally-enclosed fan-cooled motors which are fully protected against such destructive agencies.

As the upper diagram shows, Wagner type CP motors are self-protected against the entrance of dust, fumes, and moisture, and therefore give uninterrupted service despite severe operating conditions. Experience has proved time after time that motor protection costs less than motor maintenance, that maintenance costs go down, production goes up, and motor worries end when you standardize on Wagner CP motors throughout your plant.

Wagner type CP motors are available in several electrical types, and are but one of a widely diversified line of Wagner motors, all fully described in Bulletin MU-185 free upon request addressed to Wagner Electric Corporation, 6418 Plymouth Avenue, St. Louis 14, Mo.



The heart of the Wagner CP motor is this rugged, all-steel stator, rigidly constructed to meet the exacting needs of modern high-speed production. In larger sizes, the outer surface is deeply grooved (as here shown) to provide ample cooling surface for cool operation. The winding is completely taped well into the slots and all phase coils are insulated from each other by varnished-muslin phase-sheets.

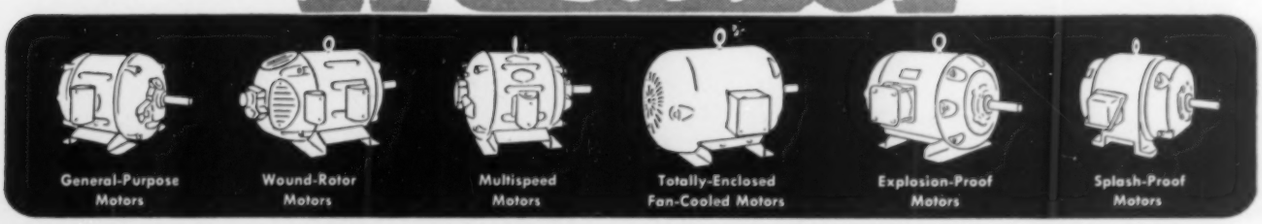
M46-3

Consult Wagner Engineers on all Electric Motor Problems

Electric Motors • Air Brakes • Brake Lining Hydraulic Brakes

Wagner

Transformers • Industrial Braking Systems NoRoL • Tachograph



Sales and Service Branches: ATLANTA 3 • BALTIMORE 18 • BOSTON 15 • BUFFALO 8 • CHICAGO 16 • CINCINNATI 10 • CLEVELAND 15 • DALLAS 1 • DENVER 2 • DETROIT 2 HOUSTON 2 • INDIANAPOLIS 4 • KANSAS CITY 8 • LOS ANGELES 15 • MEMPHIS 3 • MILWAUKEE 2 • MINNEAPOLIS 4 • NEW YORK 7 • OMAHA 2 • PHILADELPHIA 8 • PITTSBURGH 13 • PORTLAND 9 • ST. LOUIS 3 • SALT LAKE CITY 1 • SAN FRANCISCO 3 • SEATTLE 4 • SYRACUSE 2 • TULSA 3 • WASHINGTON 5 • *In Canada:* WAGNER ELECTRIC AT LEASIDE, ONTARIO—*Wagner motor parts are available at 350 Wagner-owned and -contract repair shops.*

Are You Using Cut-off Wheels *that Really Fit Your Jobs ?*

WHEN a Norton abrasive engineer tackles your cut-off jobs he's not limited to one special type of wheel. He has a *complete line* to choose from — over 50,000 possible specifications. For example, he has several varieties of resinoid bond, both natural and synthetic rubber bond, and shellac bond. He has Alundum, 57 Alundum and Crystolon abrasives. And in each abrasive and bond he has a wide range of grit sizes, grades (hardnesses) and structures.

You can be sure that a survey of your cut-off jobs by a Norton abrasive engineer will really cut costs for you — that among his 50,000 possible specifications there's the low cost wheel for each of your cut-off jobs.

NORTON COMPANY
WORCESTER 6, MASS.
Behr-Manning, Troy, N. Y. is a Norton Division

ON THE COVER

IN 1931, an international group of scientific organizations, aided by the Jungfrau Railway Company, established in Switzerland a meteorological observatory designed to gather data of value to astronomers, weather bureaus, physicians, and specialists in aerodynamics. The main building is on the sheltered southern slope of Jungfrauloch Mountain. The building pictured on our cover, and which was added later, is on the summit, 11,722 feet above sea level. The two structures are connected by an elevator in the interior of the mountain. The photograph was made by R. Schudel and is published through the courtesy of the Jungfrau Railway.

•

IN THIS ISSUE

ONE of the interesting features of the article on the Cleveland Quarries that starts on the following page is the description and pictures of two air compressors that have been in service since 1903. Although outmoded by present standards, they still carry the load and have compiled a remarkable record of dependability and economy of maintenance.

•

WITH the war over, construction jobs for civilian purposes are being resumed. The one covered by the article that begins on page 6 is a bridge across the Passaic River at Newark, N. J., that will speed the trip of many commuters who travel to and from New York in automobiles. The placing of the piers involved the use of compressed-air caissons, affording work for the highly skilled sandhogs who took an enforced vacation from their regular calling during the war period.

•

PERU is engaged in an ambitious construction program that is intended to pave the way for various industrial enterprises. A resumé of these activities (page 12) is presented by an American engineer who was intimately connected with planning them.

•

AS SOON as strategic islands in the Pacific Ocean were wrested from Japanese control, they became beehives of construction activity to make them of maximum service in furthering the advance on Tokyo. In this work, air compressors and rock drills were indispensable aids to our soldier-engineers. How Guam island was quickly transformed into a strong military base is told by a man who was there. See page 15.

Compressed Air Magazine

COPYRIGHT 1946 BY COMPRESSED AIR MAGAZINE COMPANY

VOLUME 51 **January, 1946** NUMBER 1

C. H. VIVIAN, *Editor* J. W. YOUNG, *Director of Advertising*
ANNA M. HOFFMANN, *Assistant Editor* J. J. KATARBA, *Advertising Mgr.*
D. Y. MARSHALL, *Europe*, 243 Upper Thames St., London, E.C.4.
F. A. MCLEAN, *Canada*, New Birks Building, Montreal, Quebec.

EDITORIAL CONTENTS

43-Year-Old Compressors Still Serve Quarries 2
A New Bridge at Newark—*S. G. Roberts* 6
Pneumatic Dummies Served as Invasion Foil 10
Peru Developing Natural Resources—*Charles A. Howard* 12
How Air Helped Build a Military Base—*R. P. Day* 15
Compressed Air at Work 18
Mobile Dental Units for the Navy—*R. G. Skerrett* 20
Air Modulation Helps Give Loud Speaker Long Range 22
Editorials—Farm Mechanization—Aircraft Research 24
Industrial Notes 25
Industrial Literature 27

ADVERTISING INDEX

Allis-Chalmers Mfg. Co. 22
American Brass Co., The 23
American Leather Belting Asso. 7
Bird-White Co. 35
Bucyrus-Erie Co. 6
Cities Service Oil Co. 21
Commercial Filters Corp. 10
Compressed Air Magazine Co. 32
Conrader Co., R. 38
Cook Mfg. Co., C. Lee 28
Coppus Engineering Corp. 2nd Cover
Crane Co. 11
Crane Packing Co. 16
Dayton Rubber Mfg. Co., The 40
Dollinger Corp. 3
Easton Car & Construction Co. 9
Eimco Corp., The 12, 13
Elliott Co. 8
Farris Engineering Co. 32
Galland-Henning Mfg. Co. 36
Hercules Powder Co. 31
Hose Accessories Co. 34
Industrial Clutch Co., C. M. Eason 33
Ingersoll-Rand Company
4, 15, 26, 36, 3rd Cover
Lebanon Steel Foundry 29
Maxim Silencer Co., The 27
Murphy & Co., Jas. A. 34
National Forge & Ordnance Co. 25
Naylor Pipe Co. 19
Nicholson & Co., W. H. 36
New Jersey Meter Co. 38
Norgren Co., C. A. 34
Norton Co. 18
Powell Co., The Wm. 30
Schieren Co., Chas. A. 35
Socony-Vacuum Oil Co., Inc.
4th Cover
Square D Co. 38
Terry Steam Turbine Co., The 24
Texas Co., The 5
Timken Roller Bearing Co., The 37
United States Rubber Co. 14
Universal Filter Co. 32
Vogt Machine Co. 20
Wagner Electric Corp. 17
Walworth Co. 39
Wisconsin Motor Corp. 35

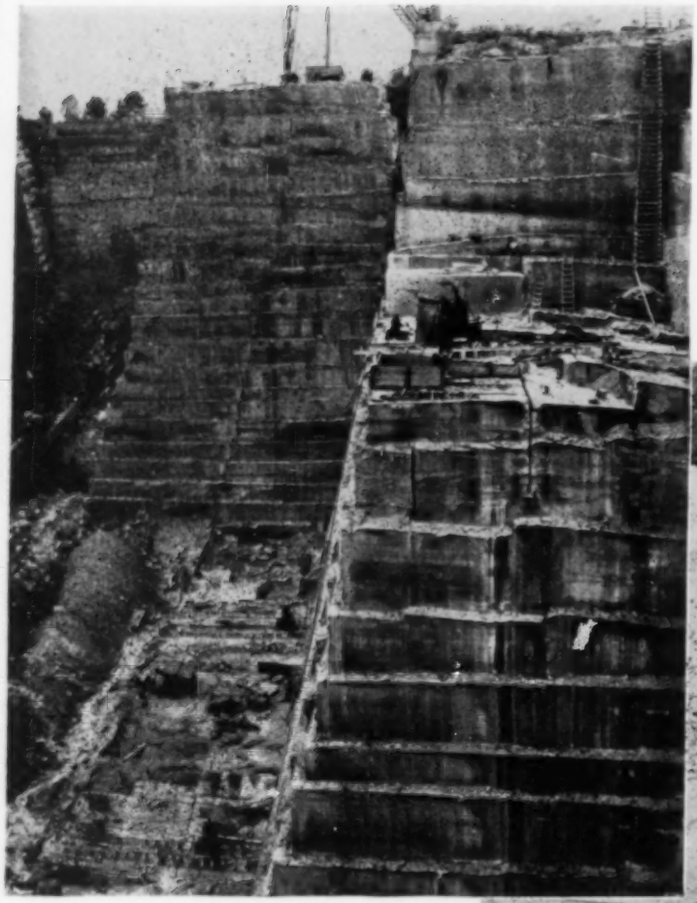
A monthly publication devoted to the many fields of endeavor in which compressed air serves useful purposes. Founded in 1896.

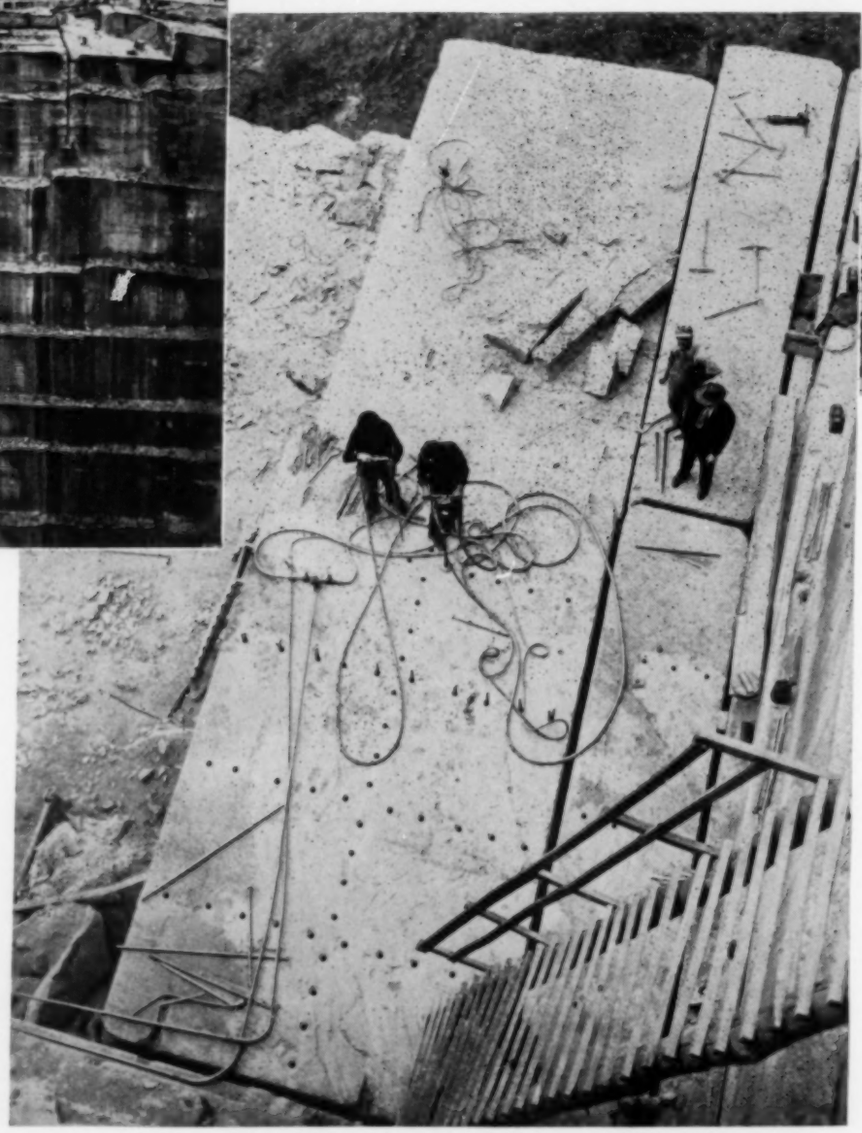
CCA Member Controlled Circulation Audit.

Published by Compressed Air Magazine Co., G. W. MORRISON, *President*; C. H. VIVIAN, *Vice-President*; J. W. YOUNG, *Secretary-Treasurer*
Business, editorial, and publication offices, Phillipsburg, N. J.
Advertising Office, 11 Broadway, New York 4, N. Y., L. H. GEYER, representative.
Annual subscription: U.S., $3.00; foreign, $3.50. Single copies, 35 cents.
COMPRESSED AIR MAGAZINE is on file in many libraries and is indexed in Industrial Arts Index.

43-Year-Old Air Compressors Still Serve Quarries

Photos from Compressed Air Institute



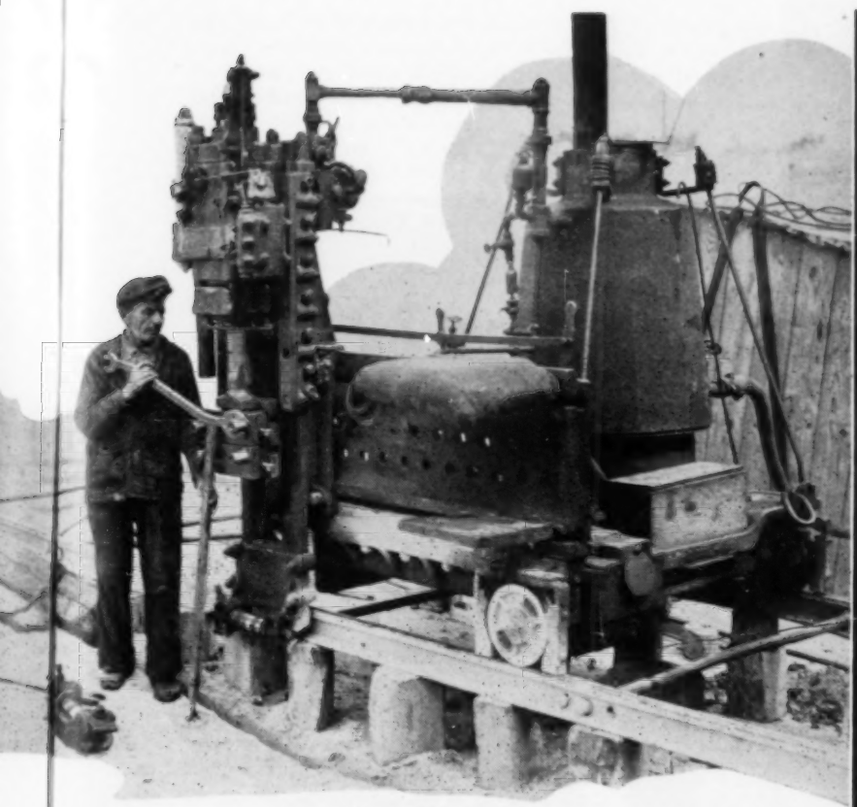


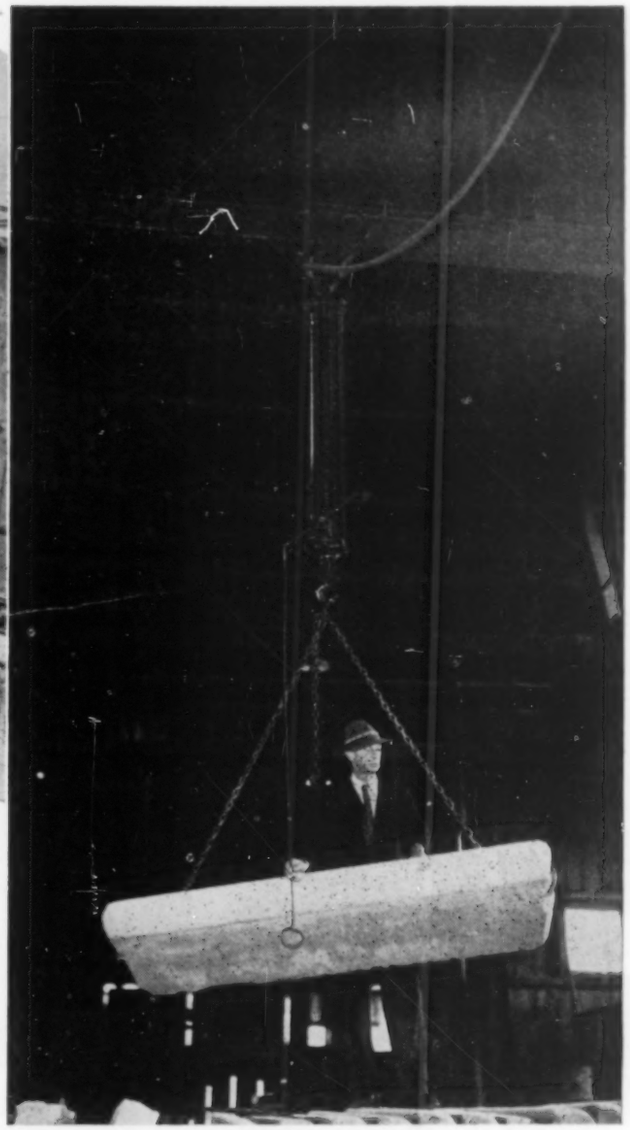
FROM five deep quarries, carved in the earth at the edge of the hamlet of South Amherst, Ohio, during the past half-century, has come sandstone to provide curbing for many city streets, grindstones for farms and industry, exterior stone for monumental buildings, and refractories for lining furnaces. Sandstone for the two first-mentioned uses was once shipped from this area to all parts of the country, but more recently business has fallen off because of the competition offered by concrete and artificial abrasive stones. The quarries have continued to operate, however, and during the war period even attained a measure of their former prosperity when the sharp increase in steel-making facilities quickened the demand for heat-resistant linings for various types of melting furnaces.

The latest issue of *Minerals Yearbook*, published by the U. S. Bureau of Mines, credits Ohio with 44 percent, by value, of the nation's sandstone production in 1942. It adds that "the largest quarries are in the Amherst area in the northern part of the state." The operations under discussion are conducted by the Cleveland Quarries Company, and the workings are claimed to be the largest in existence for the production of sandstone. They are very deep and spacious, so much so in fact that men laboring at the bottom of one of them appear as specks to an observer peering over the edge at surface level.

Throughout the entire period since the beginning of the century, during which millions of cubic feet of stone have been cut out and hoisted slab by slab, air compressors have been the principal source of power applied to the task. Two venerable machines that were set up in 1903 have carried the air load ever since that time and are in good service condition today. Until 1929, both of them were run whenever the quarries were working, and during the first twelve years of their service they operated 24 hours a day for days at a time. By making minor changes in 1929, it was possible to increase their output so that one machine could carry the load. This permitted alternating them in service, and that is still being done. The quarries are now working ten hours daily.

The air is compressed to approximately 95 pounds pressure and is distributed





GENERAL VIEWS

A section of one of the quarries from which air-powered equipment has cut millions of tons of stone is shown at the extreme left. Work is underway on the floor and on the ledge at the right, where a channeling machine is visible. The downward view (left) shows a workman putting down one of a series of holes which will be used to break the larger block into smaller ones by the plug-and-feather method. The man at the left is inserting an air pipe in a hole to blow it clear of cuttings. The various large key blocks on which the men are standing were cut loose from the mother bed by track channelers, one of which is shown above. The workman is about to insert a cutting bar in the chuck of its piston-type rock drill. As built, channeling machines included a boiler for generating operating steam, but at these quarries, as in most other places where they are still used, they have been run with air for many years. The vessel on the right of the machine is an air heater. An 850-pound piece of sandstone curbing is shown at the right being lifted by an air-cylinder hoist for loading it on a flat car. The operation is handled by one man

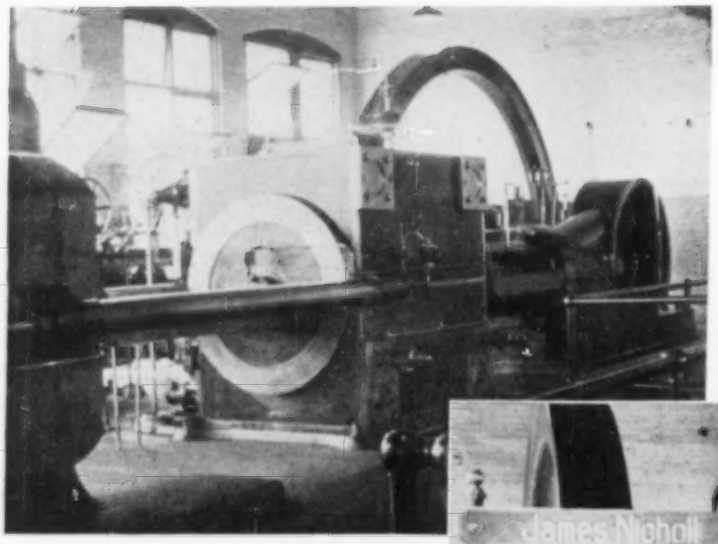
throughout the quarry area by 16 miles of piping. These lines are so tight and so well maintained that there is virtually no loss, the pressure between the plant and the most distant point in the system, about a mile away, varying only 2 or 3 pounds. In the quarries, compressed air is used chiefly for operating channeling machines, rock drills, and pumps. As an accompanying picture shows, the channeling machines make the vertical cuts to detach large blocks or slabs of stone from the continuous beds. The big blocks are then subdivided in place into smaller ones by putting down rows of holes with hand-held rock drills and by breaking the stone along these lines by the plug-and-feather method. The plugs are driven with air-operated hammers, but before this is done the holes are blown out with compressed air.

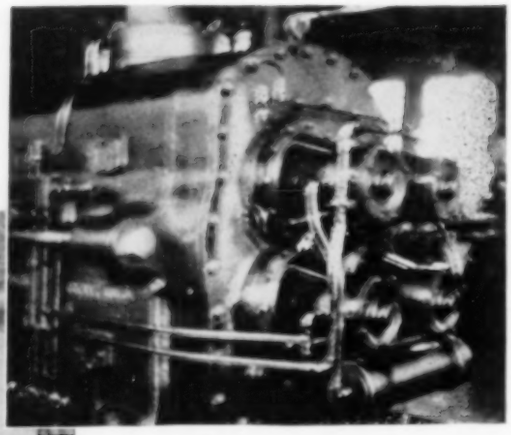
Approximately 30 pumps are employed, principally for dewatering the quarry sumps and keeping the working levels dry. Although of the conventional steam-driven type, they are operated with compressed air because steam losses through condensation in the extensive distribution system that is required would be excessive. Another use of air is in putting down prospecting holes to test and sample the underlying beds to determine their suitability for future production. These holes are drilled with core drills that are usually air operated.

The compressors discharge into a large outdoor receiver where the air is heated prior to distribution. At the quarries some of it is again heated, raising its temperature to 275°F. Each channeling machine has an air heater attached to it, and the air supply for these machines is heated the year round. Air for the other equipment is heated during the colder months only. Heating expands the air and minimizes condensation of moisture in the tools, thereby preventing freezing and improving lubrication.

Aside from the important part it plays in the actual quarrying of the stone, compressed air serves widely in performing the accessory work. In the curbing yard and planing department, some 30 air-cylinder hoists handle the heavy blocks of stone. They are preferred to other equipment of this type because they permit of extremely close and precise control during loading operations and the cost of maintaining them is relatively low. Comparatively recently it was found that another piece of air equipment could be utilized to advantage in this department in place of a drill press for putting holes in sandstone blocks sold for lining cupolas. Someone suggested that perhaps greater speed and equal accuracy could be obtained by means of an ordinary Jackhamer rock drill mounted on a stand. Upon being tried out, the set-up proved so satisfactory that it was adopted for that work. In this department, also, small plug drills of ⅞ and 1-inch sizes serve extensively for cutting firestones and for similar operations.

A completely equipped machine shop is responsible for the repair and maintenance of mechanical equipment and builds special quarrying machines. At times it also does work for neighboring quarries.





IN THE COMPRESSOR ROOM

The walls of the room are too close to the machines to permit photographing a complete unit, which measures 18½ x 46½ feet. A partial view of the low-pressure side of one compressor appears at the upper left. Part of the air cylinder is at the left, the steam cylinder is in the center, and the flywheel is beyond it. The picture above shows the rear portion of one of the air cylinders as it appeared before its original valves were changed. In the cluster of extensions at the right may be seen four small air cylinders that actuated the valves. The piping carried air to them. When these compressors were installed it was customary in some plants to name outstanding machines for men in the organization. Shown at the left is the gauge board for the compressors and over it the name of James Nicholl, who was one of the early officials of the company.

Here, too, compressed air is helpful by blowing cuttings away from machine tools, removing grease and dirt from equipment brought in for attention, and by doing other typical machine-shop jobs. Adjoining the shop is an equipment-testing room where repaired air-operated tools are checked under actual running conditions before being sent back to work. In the blacksmith shop, where drill steels and various other cutting tools used in quarrying and dressing the stone are regularly resharpened, compressed air is used to aid combustion in the oil-fired heating furnace and also to operate the drill-steel sharpener.

The history of the two old compressors is interesting and indicates that this class of machinery is very durable when given reasonable care. It is not often that machines of their age are kept in active service, because most users acquire new equipment from time to time to take advantage of improvements in design and construction. But in some cases, of which this one is a striking example, the older units meet the needs satisfactorily and are consequently retained long after their normal operating period has expired.

The compressors, which are identical, are of the 2-stage, duplex-type and are driven by compound steam cylinders. Each has an output of approximately 5000 cfm. They are massive machines and take up several times the floor space occupied by modern compressors of the same capacity. The air cylinders and a large flywheel are at opposite ends, with the steam cylinders near the middle. The units were sold by the Ingersoll-Sergeant Drill Company, one of the predecessors of Ingersoll-Rand Company, and are designated as "Class C," the "C" standing for Corliss steam engine, the type used as drivers. The low-pressure steam cylinder of each machine is 44 inches in diameter, the high-pressure cylinder 20 inches, and both have a 48-inch stroke. The low- and high-pressure air cylinders are 39¼ and 24¼ inches in diameter, respectively, and have a 48-inch stroke.

In their day, these compressors ranked among the finest machinery made. A catalogue published in 1906 called them the "thoroughbreds of the compressor class," and "high-duty machines representing the extreme of the designer's art." It also recorded that they held the world's record for efficiency. They were not advertised or stocked in standard sizes, being built to order to meet the user's needs and in accordance with the steam-producing plant on the premises or planned. All were large-capacity units built for heavy and continuous service, and some of 60-inch stroke were produced.

Old records of the manufacturing concern show that the air cylinders and accessory gear were shipped from the factory at Easton, Pa., on October 1, 1903, to the Cleveland Stone Company, of which the present Cleveland Quarries Company is the successor. The engine end was made by a separate concern, the C. & G. Cooper Company of Mt. Vernon, Ohio. That was the usual custom in those days, the two component sections being shipped from the plants where they were built and then assembled where the complete machine was to operate.

As delivered, the air cylinders were equipped with air-moved valves. Movement of the piston by this design was transmitted through mechanical connections to a small air cylinder mounted on one side of the compressor cylinder. The air cylinder, in turn, transmitted pneumatic impulses through piping to other cylinders, of which there was one for each inlet valve and each discharge valve. The latter cylinders were mounted on the fronthead and backhead of the compressor cylinders and served, by means of pistons, to open and close the valves. This arrangement was subsequently changed.

From Samuel Wragg, chief engineer of The Cleveland Quarries Company who has been in charge of the compressor plant since 1925, we have obtained the history of the machines since they went into operation. "The plant," says Mr. Wragg, "cost $97,000 and was one of the most

modern of its kind when it was put in. It consisted of three 250-hp. Stirling boilers to which two more 250-hp. units were later added, complete with feed-water heater and live-steam purifier, pumps, controls, etc., plus the two air compressors. The compressors ran at 75 rpm., and at the time I assumed charge of the plant they had been operating for 23 years with the air-thrown valves. These valves had given good service, but were expensive to maintain in good working order, the cost per year for regrinding and replacements ranging from $1100 to $1500.

"In 1928 we started revamping the plant and the first thing on the program was the improvement of the air-compressor valves. Inquiries revealed that Ingersoll-Rand plate valves could be installed on the 25-year-old machines by simply removing the complete assembly of heads and valves, and bolting on new ones. This was done, at a cost of less than $6000, which did not equal the expense of five years' maintenance of the old valves. The new valves were added in the forepart of 1929, and we have since spent nothing on them. We still have the spare parts that we ordered when we made the change. After five years of operation, we removed and inspected the valves on one of the compressors and found them in good condition. Consequently, we did not remove the valves from the other machine, and they have not been taken out yet.

"We had been told before the new valves were installed that they would increase our air output by around 10 percent. We wanted to run a test to see if this was true, but we had no instruments to record the volume of air compressed, so we had to figure out a way of getting the answer without them. Before removing the old valves, we overhauled them, and then we kept a record each morning for ten days of the number of revolutions of the compressors required to bring the pressure in the air lines and receivers up to 80 pounds. This was found to average 696 revolutions. We then put the new valves in and made a similar count for ten days. The average was then found to be 632 revolutions, or 64 less than previously. The indicated gain in efficiency was slightly more than 9 percent.

"At the time the new valves were put in, we rebored the steam cylinders, rebabbited the crank pin and main bearings, and installed new crank pins and wrist pins, all of which still remain in good condition. We noted smoother operation of the engines immediately, and that has continued.

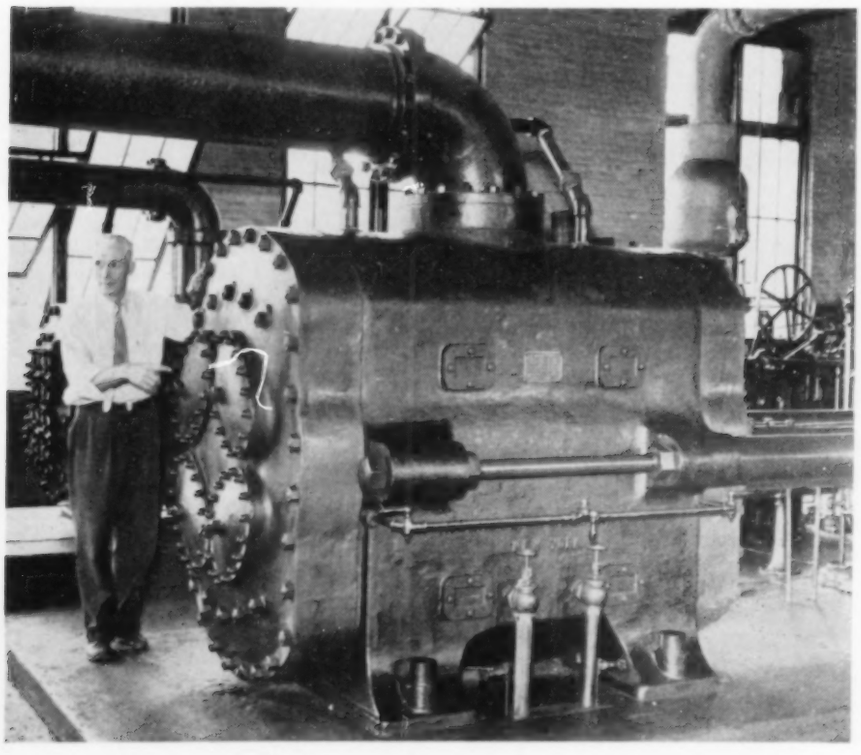
"After running the test, we brought up the question of increasing the speed of the compressors from 75 to 90 rpm., and were told we could probably do this, but would have to watch for valve breakage. We speeded up the machines without any valve trouble developing and this enabled us to hold the load and carry the peaks with one machine operating, whereas we had previously had to use both of them. The greater speed probably lowered the compression efficiency, but our coal and maintenance bills were reduced and we also found it possible to maintain a steadier pressure in the air lines.

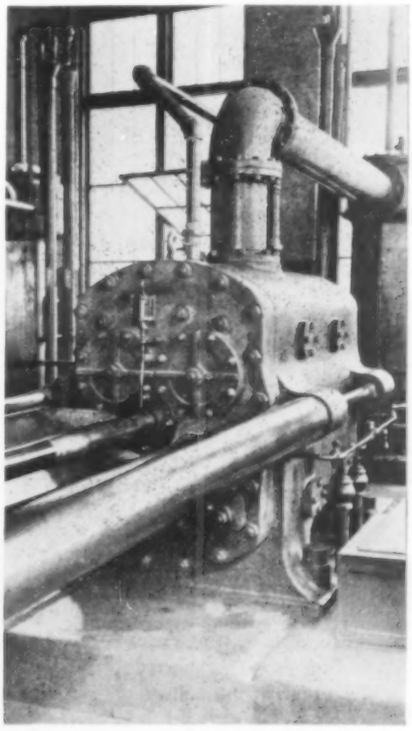
"The change of heads and valves considerably reduced the lubricating oil consumption of the air cylinders. We had 18 lubricators on each cylinder with the old valves, whereas now we have but one.

"The air cylinders still have the original pistons. In 1928 new rings were put on them. We checked the air cylinders in 1940 and found them to be 0.023 to 0.025 inch oversize. The wear has been uniform throughout, the centers being out of round only 0.005 inch less than the ends. The largest diameters are sideways and not vertical. As the pistons have no tail rods, they seem to float in the cylinders, with a slight side thrust at the end of each stroke.

"I can find no record of cleaning any carbon from the cylinders and I have never removed any from discharge chambers or valves. Our boiler plant now consists of one 471-hp. and one 512-hp. unit. The original compressors have worn out one set of boilers and have ten years on the new set."

During the era when these compressors were purchased, it was not unusual to name important machines for persons who had been or were then prominent in the establishments concerned. Following out this custom, there was erected above the compressor gauge board a brass plate bearing the name of James Nicholl, and it still remains there. Mr. Nicholl was a pioneer quarryman and his son, James Nicholl, Jr., was general manager of the quarries when the compressors were set up.



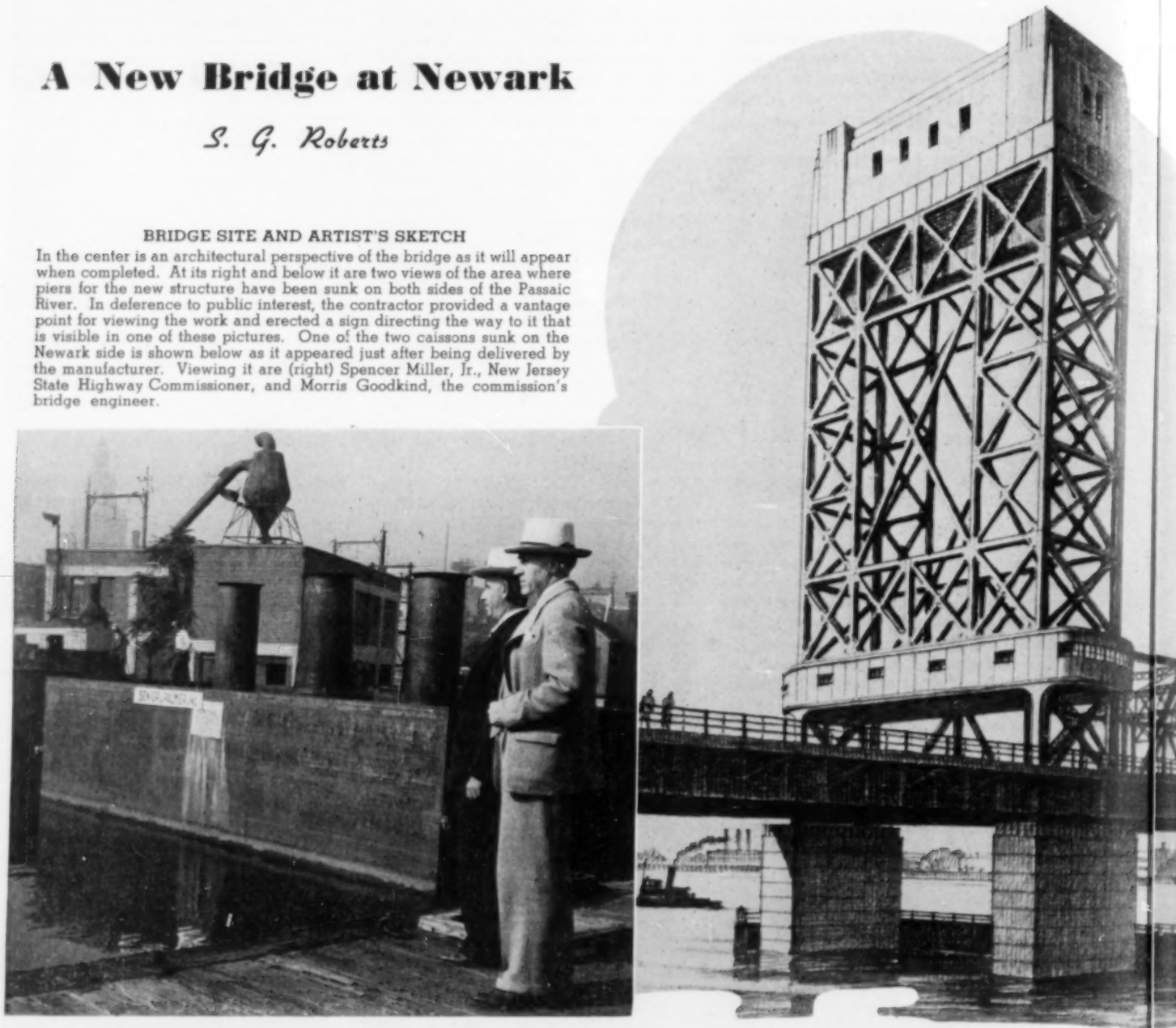


COMPRESSOR CYLINDERS

Chief Engineer Samuel Wragg (left) standing beside the high-pressure cylinder of one of the compressors and pointing to the plate valves that were installed in 1929 to replace the original air-thrown valves. The other picture shows the fronthead end of the low-pressure cylinder of one of the machines.

A New Bridge at Newark

S. G. Roberts



BRIDGE SITE AND ARTIST'S SKETCH

In the center is an architectural perspective of the bridge as it will appear when completed. At its right and below it are two views of the area where piers for the new structure have been sunk on both sides of the Passaic River. In deference to public interest, the contractor provided a vantage point for viewing the work and erected a sign directing the way to it that is visible in one of these pictures. One of the two caissons sunk on the Newark side is shown below as it appeared just after being delivered by the manufacturer. Viewing it are (right) Spencer Miller, Jr., New Jersey State Highway Commissioner, and Morris Goodkind, the commission's bridge engineer.

ONE more river crossing, and a much needed one at that, is to span the Passaic River a few hundred feet upstream from the Delaware, Lackawanna & Western Railroad's swing bridge. The foundation piers for the new structure—the William A. Stickel Memorial Bridge, have been recently completed by Senior & Palmer, Inc., for the New Jersey State Highway Department.

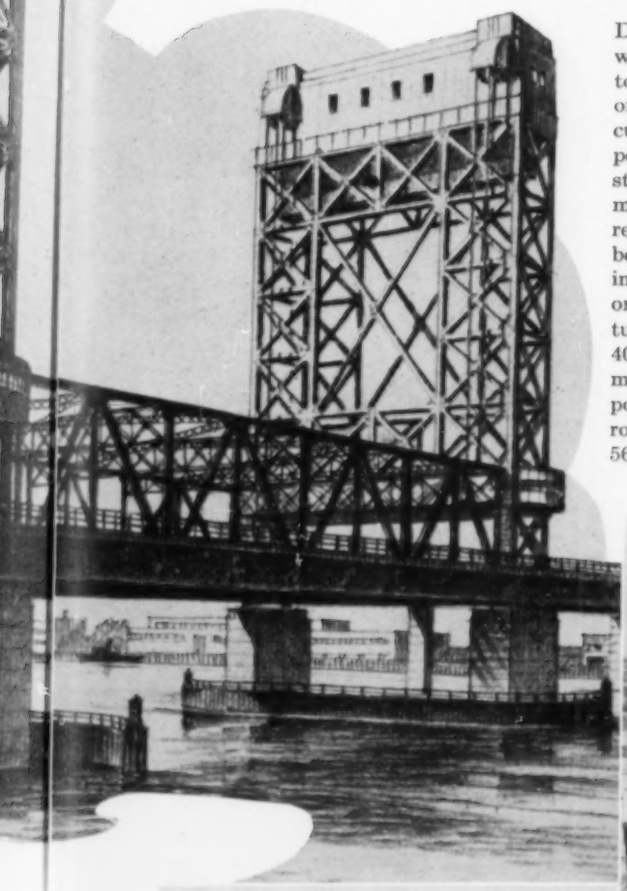
The memorial span is intended to supersede the relatively old and much-used Bridge Street Bridge a short distance downstream which joins Newark with Harrison and is tributary to one of the busiest sections of Newark—New Jersey's largest city and a nationally known industrial center. The Bridge Street crossing is an essential link in a route that runs eastward to Jersey City and thence connects by subaqueous tunnels or ferries with New York City. It is a low swing structure that has to be opened for all but the smallest craft on the Passaic River, and one does not have to be especially imaginative to envision what repeated opening does to interrupt vehicular movements, particularly at the peak hours when travel is dense.

The building of the Stickel Memorial Bridge is in response to increasing demand for ampler accommodations for traffic bound east and west across the Passaic. The necessity for such improvements was recently explained by the New Jersey State Highway Commissioner, Spencer Miller, Jr., as follows: "The State is at a point where it has to catch up on a 15-year lag in highway development. We knew what we needed in 1930, but the depression came along and held us up. Just as we got ready for action again, the war came along and put a stop to construction." In addition, Mr. Miller emphasized the situation by pointing out that North Jersey has been losing population in the same ratio that Westchester and Long Island, N. Y., have been gaining, and mainly because New Jersey has no adequate highway system to take people quickly to urban centers.

The new crossing has been conceived to take care of traffic between Newark and the populous outlying suburban sections of Essex County; and to do so it will connect with a splendid, projected freeway that will run above grade or be depressed, as may be required, to permit through automotive traffic to speed along without interfering with local cross traffic. The planners of both the bridge and the freeway have in mind the inevitably large increase in power-driven vehicles and the

greater speeds at which they will be able to travel in the future.

The Passaic is navigable from Newark Bay upstream for 15.4 miles to the bustling city of Passaic, which lies 7.3 miles above Newark. At the latter place the channel is 16 feet deep and 200 feet wide, and at a point not far above the site for the memorial bridge the channel has a depth of 10 feet and a width of 150 feet. River traffic is considerable, but manifestly not of as great a volume as the channel would permit and as it probably will be when all the bridges across the stream afford unhampered shipping movement and full advantage is taken of water carriage.

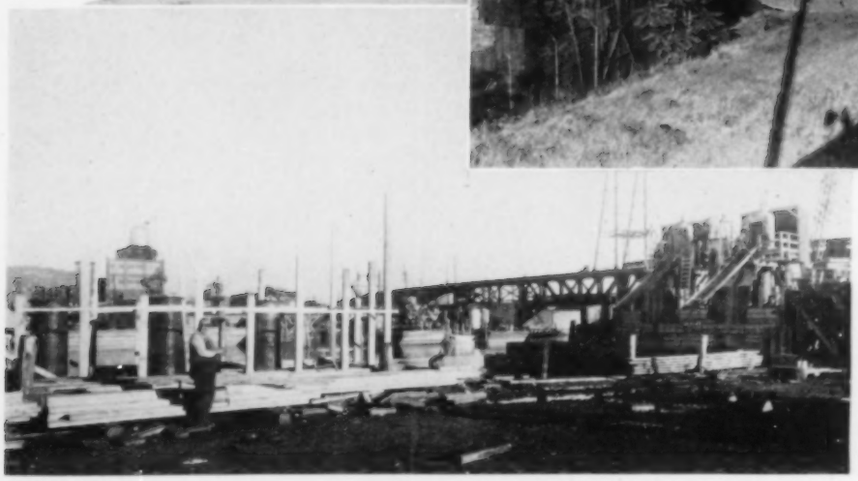


The superstructure of this latest of Newark's bridges will be supported by four masonry piers and will be of the vertical lift type. It will have a clear span of 200 feet between opposing pier fenders for the passage of vessels, as prescribed by the U. S. War Department. Vertical clearance at mean high water will be 35 feet when the lift span is down and the crossing is open to vehicles, and 135 feet when the span is raised to its maximum height to permit a masted craft to pass. It is estimated that with the span closed the clearance will ordinarily be ample 85 percent of the time to take care of ships for which the Bridge Street Bridge now has to be swung open.

The foundation work was completed December 1945 by Senior & Palmer, Inc., who used the pneumatic-caisson method to carry and key the masonry piers—two on each side of the river—to bedrock. The cutting edges of the four caissons had to penetrate an overburden of silty sand, a stratum of clay and boulders, and a formation of seamy shale before finally reaching solid rock, where footings have been established in excavations ranging in depth from 3 to 4 feet. On the Newark or west side of the Passaic, the two structures were brought to rest at a depth of 40 feet below the surface of the stream at mean high tide, while those on the opposite shore, because of the dip of the bedrock toward the east, have their footings 56 feet below water level.

The steelwork for the caissons was fabricated at the plant of the New York Engineering Company, Yonkers, N. Y., and towed down the Hudson River to Newark Bay and thence up the Passaic to Newark, where it was delivered early last September. Each of the rectangular, watertight boxes is 41.5 feet long and 19.5 feet wide, with the short side parallel with the bulkhead line. The bottom edge was reinforced to provide the cutting edge that had to withstand rough treatment as the structure forced its way downward to bedrock through the obstructing materials. The working chamber, which was open at the bottom, had a height of 6 feet above the cutting edge, and its sides and ends sloped upward and inward to the steel roof of the chamber within which the sandhogs had to do their excavating under increasing air pressure to force the water outward as the caisson gradually settled.

Prior to the arrival of the caissons their anchorages had been superficially leveled by the Schultz Dredging Corporation and piles had been driven to steady the structures and to hold them in their prescribed positions during the sinking operations. Leading down through each caisson and spaced at equidistant points along the longitudinal center line were three towering tubular shafts of steel. The central one, when fully equipped, had a man lock on top large enough to hold fifteen persons. This served as a passageway and



BOTTOM OF A CAISSON

A picture made in the working chamber after the caisson had been landed on bedrock. The floor is being cleaned thoroughly preparatory to pouring the first concrete.

was provided with a steel ladder by which the workers could reach the working chamber from the surface or ascend from it while that chamber was under air pressure. The two neighboring shafts, also fitted with locks but of a different type, permitted the raising and lowering of the buckets by which the excavated material could be brought to the surface for disposal without disturbing the air pressure in the working chamber. The muck was either dumped on shore or loaded into barges by chute or crawler cranes.

The steelwork of the caissons was carried about 8 feet above the roofs of the working chambers to support the boxlike timber structures or surmounting walls that were progressively extended upward as the caissons sank to keep their tops at a safe height above the surface of the river. Internally the timber sheeting was reinforced by heavy vertical posts as well as horizontal and diagonal bracing, all of timber. The surmounting walls likewise served as forms in which to place the concrete that was to give the caissons the necessary dead weight to carry them down and eventually to build up the massive piers upon which to set the towers that will guide and sustain the lift span. Concrete was poured, step by step, until the piers reached a final height of 33.5 feet above mean high-water stage.

Work on the substructure of the Stickel Memorial Bridge was under the personal supervision of James F. Armstrong, vice-president of Senior & Palmer, Inc., to whom we are indebted for the particulars regarding the present contract. Caisson sinking started the last week of September, 1945, and was carried on continuously, day and night, until it was concluded on October 30 of that year. Concrete was placed with 1-yard dump buckets in lifts varying from 3 to 5 feet in thickness, and wherever necessary the material was compacted by pneumatic vibrators driven by Multi-Vane air motors. When each caisson was firmly seated on bedrock, then its working chamber was filled with concrete. That material was dropped from the tops of the muck-lock shafts so that the impact of the fall would be sufficient to compact it during the final pouring stages. The concrete was transit-mixed and delivered by trucks from a nearby commercial plant.

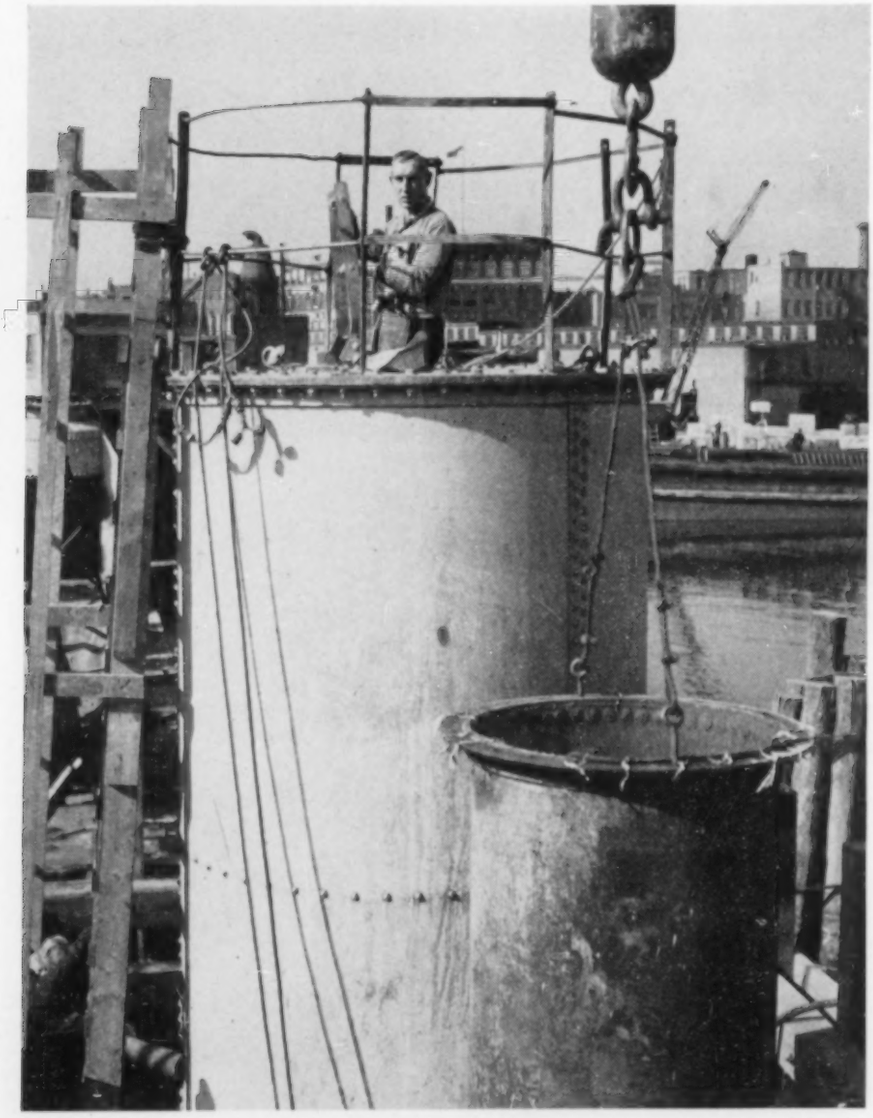
During the sinking of the caissons, and especially while working downward through the strata of clay and boulders and the seamy shale, the contractor used both No. 75 I-R pneumatic diggers and L-54 paving breakers, the latter equipped with chisel-edge steels. Clearing of the final seatings in sound bedrock was done with Jackhamers of different sizes. Seepage into the working chambers and clearing away pools of fluid mud and water were taken care of by air-operated sump pumps. When engaged in cutting, preparing, and assembling the timber for the superstructures of the caissons, woodborers of the Multi-Vane type proved of great service.

The extensive use of compressed air in excavating for the piers, in checking the inflow of water into the caissons, and otherwise in facilitating the subaqueous and other operations, called for a compressor plant of considerable capacity. It was made up of eight machines of varying types and sizes with a combined output of around 5000 cfm. All were carried on board a barge moored first at the Newark dockside, with supply lines delivering to the caissons, and then alongside the East Newark shore. Subsequently, when less air was needed it was supplied by two large portable compressors at the opposite stations.

The compressor plant was an interesting one because of the contrasting types in use. This was emphasized by a PO oil-engine-driven unit, with a capacity of 1500 cfm., that was bought by Senior & Palmer back in 1929. Mr. Armstrong ex-

pressed his approval of that pioneer machine by saying, "and it is still going strong." A 500-cfm. diesel portable of the latest pattern, likewise an Ingersoll-Rand machine, offered a striking contrast. On the compressor barge there was also a small Type 30 to furnish starting air for the diesel-driven units. Further, there were accommodations aboard for the sandhogs in the form of showers, dressing rooms, and a coffee shop. The latter was necessary because pressure workers, according to medical authorities, have to have hot coffee after coming out of the working chamber. At the maximum depth of 60 feet that was reached in preparing the footings for the East Newark caissons the men were under a pressure of approximately 26 pounds per square inch.

The piers are set close to the established bulkhead lines that flank the waterway at the bridge site. There are two on each side, spaced 81 feet 4 inches apart center to center, and the distance between the opposing twin structures with their protecting fenders in place is 252 feet on centers. To safeguard the concrete piers from injury either by vessels out of control or by the damaging action of floating ice when the river is running swiftly at flood periods they are faced from a level of 5.5 feet below to 6 feet above mean high water with granite blocks obtained from the Deer Island Granite Company. The contract cost for the substructures was $441,323.



MANWAY AND MUCK SHAFT

The larger cylinder is the man lock of one of the caissons that has been sunk to bedrock. This lock was large enough to accommodate fifteen sandhogs at a time. From it, a ladder led downward to the working chamber, which is pictured on the preceding page. The smaller cylinder is the upper part of one of the two twin muck shafts. The lock has been removed from it in making ready to use it for placing concrete in the working chamber below during the final stages of the concrete pouring. The dropping of the concrete from this height served to compact it adequately.

The towers of the Stickel Memorial Bridge will rise to a maximum height of 174 feet above the tops of the sustaining piers, or 207.5 feet above the Passaic at mean high water. They will carry the vertical-lift span that will be raised fully 100 feet above its normal position when down and resting on the concrete piers. The lift span will be supported by trusses 81 feet 4 inches apart on centers and, like the adjoining shore approaches, will have a total width of 96.4 feet and a length from center to center of the shoes of 222 feet.

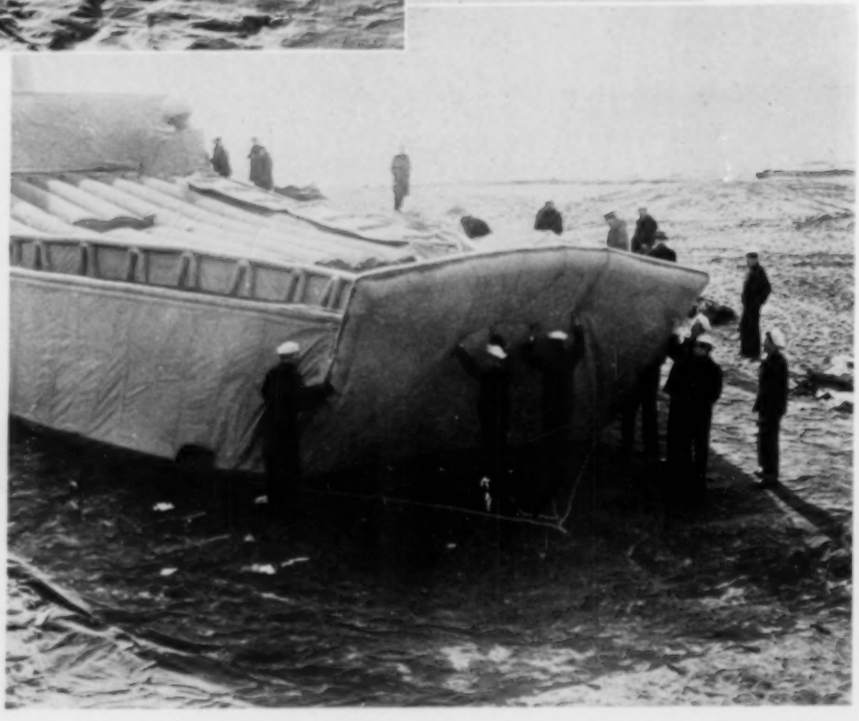
The crossing will have two roadways, each 36 feet wide, with a central 4-foot mall, and there will be a 6-foot walkway on each side. Manifestly, each roadway will be wide enough for three lines of vehicles traveling in one direction and will be capable of handling much denser traffic than the existing Bridge Street Bridge which it will supplant. Just how much of a relief the new structure will provide for the present shipping bottleneck at the Bridge Street crossing, which is a short way downstream, is indicated by the fact that another span, a few hundred yards upstream, was opened 4646 times for river craft during 1944. And the latter is actually operated less frequently in the course of a year than is the Bridge Street Bridge. At this time, some interesting structural and mechanical features must be omitted from this treatment of the new span, which has been planned as a connection for the projected freeway from Newark to West Orange now designated as Route 25-A.

Senior & Palmer, Inc., which did the foundation sinking, has been in business since 1929 and in the meantime has been successfully engaged in work of that kind for railroads, industrial plants, and public authorities in various parts of the country. During the recent war years it also had important jobs to do for the Government. In a booklet issued by the contractor, the following tribute is paid to the workers who so quickly built the foundation piers: "Many of these men have been on other jobs accomplished by Senior & Palmer, Inc., and the company expresses its appreciation of their skill and loyalty in carrying through the completion of this and other important projects." As the same source points out: "It is an old joke that doctors bury their failures—the sandhogs are different—they bury their successes."

Maj. H. R. Gabriel is the resident engineer on the project for the New Jersey State Highway Department. The piers were designed by the Bridge Division of the New Jersey State Highway Department under the direction of Morris Goodkind, bridge engineer of that division. The superstructure, which will be typically modern in its essential features, was planned by Waddell & Hardesty, consulting engineers of New York City, under the direction of Mr. Goodkind.

A SHIP THAT NEVER SAILED

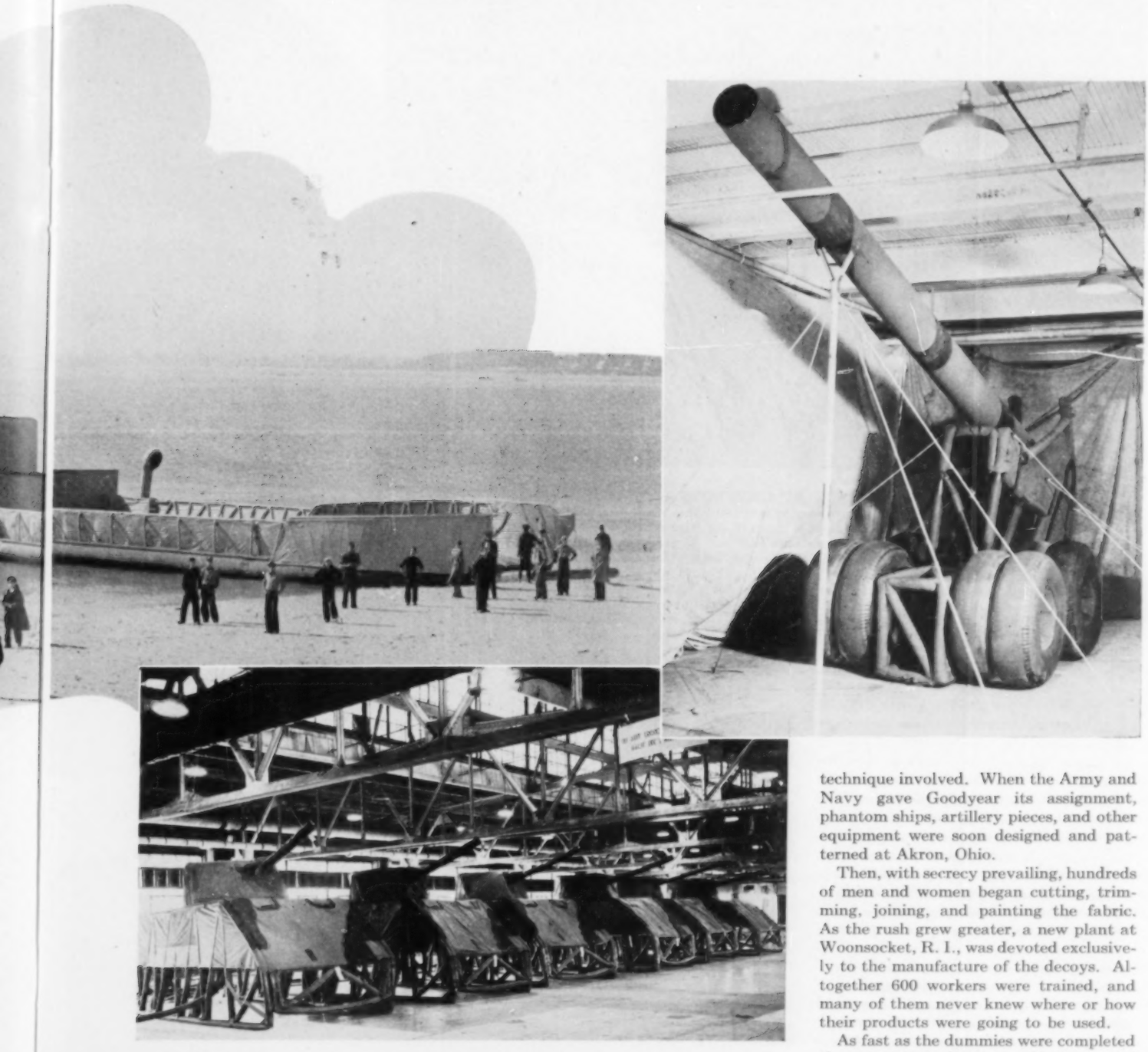
Steps in putting a make-believe LCT in the water on an English coast. Right—The compact package containing it is unwrapped on the beach. Below—As air is injected into its various compartments, it begins to assume form. Bottom—The fully inflated craft is launched by a few sailors. Center of pages—Even at close range the floating dummy looks fairly real. From the height at which enemy spotters had to fly, it provided complete deception.



IT IS now common knowledge that deception played an important part in the war in Europe. The Germans created "ghost" cities near vital manufacturing centers in an effort to trick Allied bombers into blowing up unpopulated and unproductive areas. Adopting the same ruse, the British created fake airfields to draw enemy attacks and shield their real air bases. Now it has been disclosed that huge armadas of counterfeit landing ships and related craft that originated in the United States were concentrated at various points along the English coast to confuse enemy spotters prior to the Normandy invasion of June 6, 1944.

These spurious fleets were made up of nothing more deadly than balloon-fabric dummies filled with compressed air. Built to size and painted to resemble the real thing, the "ships" and their cargoes were purposely massed in British ports where the German reconnaissance pilots were sure to see them. Naturally, Allied Supreme Headquarters had no intention of

Pneumatic Dummies Served as Invasion Foil



PSYCHOLOGICAL WEAPONS

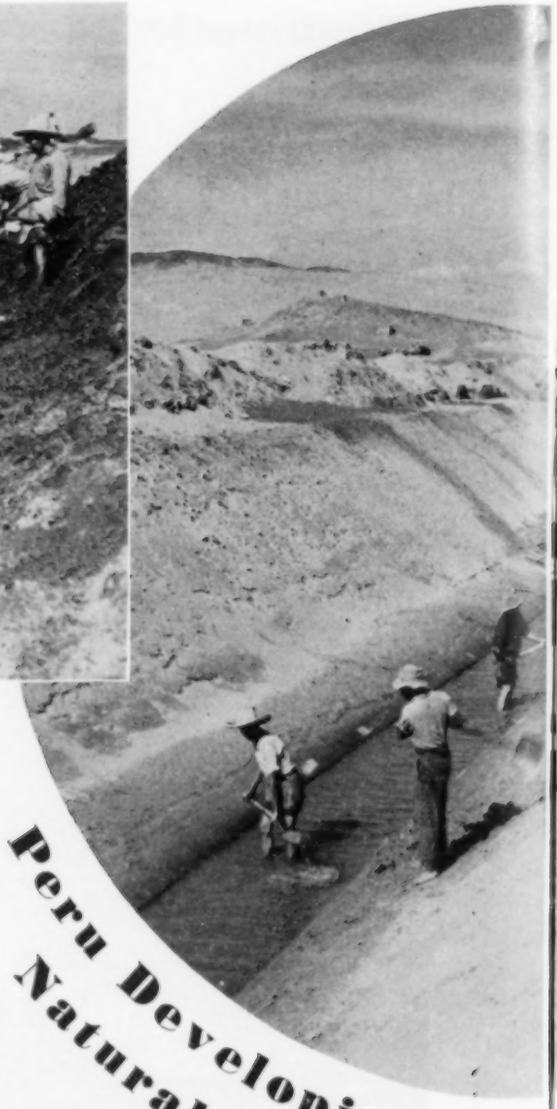
Tanks (above) and a land gun (upper right) of inflated balloon fabric assembled in a Goodyear plant for pre-shipment inspection.

launching an attack from those ports. The formidable displays were merely decoys to screen the bustling invasion preparations that were being made elsewhere. Reproductions of LCM's, LCT's, PT boats, and other naval units were given a semblance of reality, and on the "decks" of some of them were mounted convincing-looking "tanks" that were likewise constructed of cloth and inflated with compressed air.

These simulated instruments of warfare were produced in factories of the Goodyear Tire & Rubber Company, among others, for years of experience in fashioning giant cats, clowns, tramps, and serpents for circuses and parades (notably Macy's Thanksgiving Day spectacle in New York) had taught its workers the technique involved. When the Army and Navy gave Goodyear its assignment, phantom ships, artillery pieces, and other equipment were soon designed and patterned at Akron, Ohio.

Then, with secrecy prevailing, hundreds of men and women began cutting, trimming, joining, and painting the fabric. As the rush grew greater, a new plant at Woonsocket, R. I., was devoted exclusively to the manufacture of the decoys. Altogether 600 workers were trained, and many of them never knew where or how their products were going to be used.

As fast as the dummies were completed they were turned over to the Army and Navy for shipment to Europe, deflated, and folded with an eye to saving precious cargo space. The last shipment, with D-Day knocking at the door, was rushed to England by plane. Upon arrival at designated ports, they were unpacked, filled with air supplied by portable compressors, and launched. After a few days, having served their confusing purpose there, they were deflated and moved by truck to another false base, again to distract enemy attention and further muddle his defense preparations.



IMPROVEMENTS AT CHIMBOTE

It is intended to make Chimbote, near the mouth of the Santa River, the center of an extensive industrial development, and a program of improvements has been carried out there since 1942. The town was laid out 75 years ago by Henry Meiggs, an American engineer who built the Central Railway of Peru. Chimbote Bay is one of the finest natural harbors in South America. One of these pictures shows a long pier being built from the shore into deep water. Another of the works carried out was the drainage of lagoons around the town that harbored malarial mosquitoes. The work was done almost exclusively by native hand labor, as shown in two of these views.

Peru Developing Natural Resources

*Charles A. Howard**

PERU has extensive plans for developing her natural resources, including the construction of one of the largest hydroelectric stations in South America—the 125,000-kw. Canyon del Pato project on the Santa River some 250 miles north of Lima. Important as this power plant is to the future economy of the country, it is only part of a larger program which envisions full development of the waters of the Santa, Peru's largest west-coast river; exploitation of the Santa Valley's anthracite reserves estimated at ten million tons; possible erection of a steel mill close to the port of Chimbote near the mouth of the stream; an irrigation project to bring water to 250,000 desert acres; and, at a later date, a cement plant and other industries using the power to refine magnesium and other minerals which are said to exist in this region in commercial quantities.

All these undertakings and plans have been brought together through the formation of the Corporacion Peruana del Santa headed by David Dasso, formerly Minister of Finance and Commerce, and, according to Peruvian estimates, will cost about $30,000,000. An Export-Import Bank credit of $25,000,000 has been made available to assist in financing purchases in the United States of materials and equipment needed in connection with the building of public works and the development of agricultural, mining, and industrial projects.

The Department of Ancash, the region involved in this program, is one of the most beautiful sections of Peru and has been called the Switzerland of South America. There the Andes rise in two great parallel chains—the Cordillera Negra to the west, with peaks of 14,000 feet and more, and the White Mountains or Cordillera Blanca whose snow-capped heights of more than 20,000 feet give the range its name. These snow fields are not only a prime tourist attraction but also provide the Santa River with a reasonably constant, year-round flow.

The valley between these two ranges, called the Callejon de Huaylas, is about 75 miles long and 20 miles wide, and lies at an elevation of approximately 9000 feet. It is an important mineral and agricultural area and has a delighful climate. The Santa rises in the south, flows northward through the valley, turns westward in a great arc, and finally cuts its way through the coastal mountains, forming a canyon nearly 8 miles long and several thousand feet deep. There, within a distance of 5½ miles, the waterway drops about 1400 feet.

The dam for the Santa River power plant is located at the head of this canyon and is nearly 6000 feet above sea level. It is 80 feet high, 130 feet wide at the crest, and, together with the tailrace, is specially reinforced to resist the erosion of sand and gravel swept down by the floods. A 5½-mile, 18-foot diversion tunnel will convey the water to the powerhouse farther down the canyon and is expected to deliver 1375 cubic feet per second. Plans call for the eventual installation of five generators, each of 25,000-kw. capacity. Two of these machines are now in place.

The station is expected to develop power at a very low cost. An 86-mile railroad which now runs from the port of Chimbote to Hullanca, a point near the

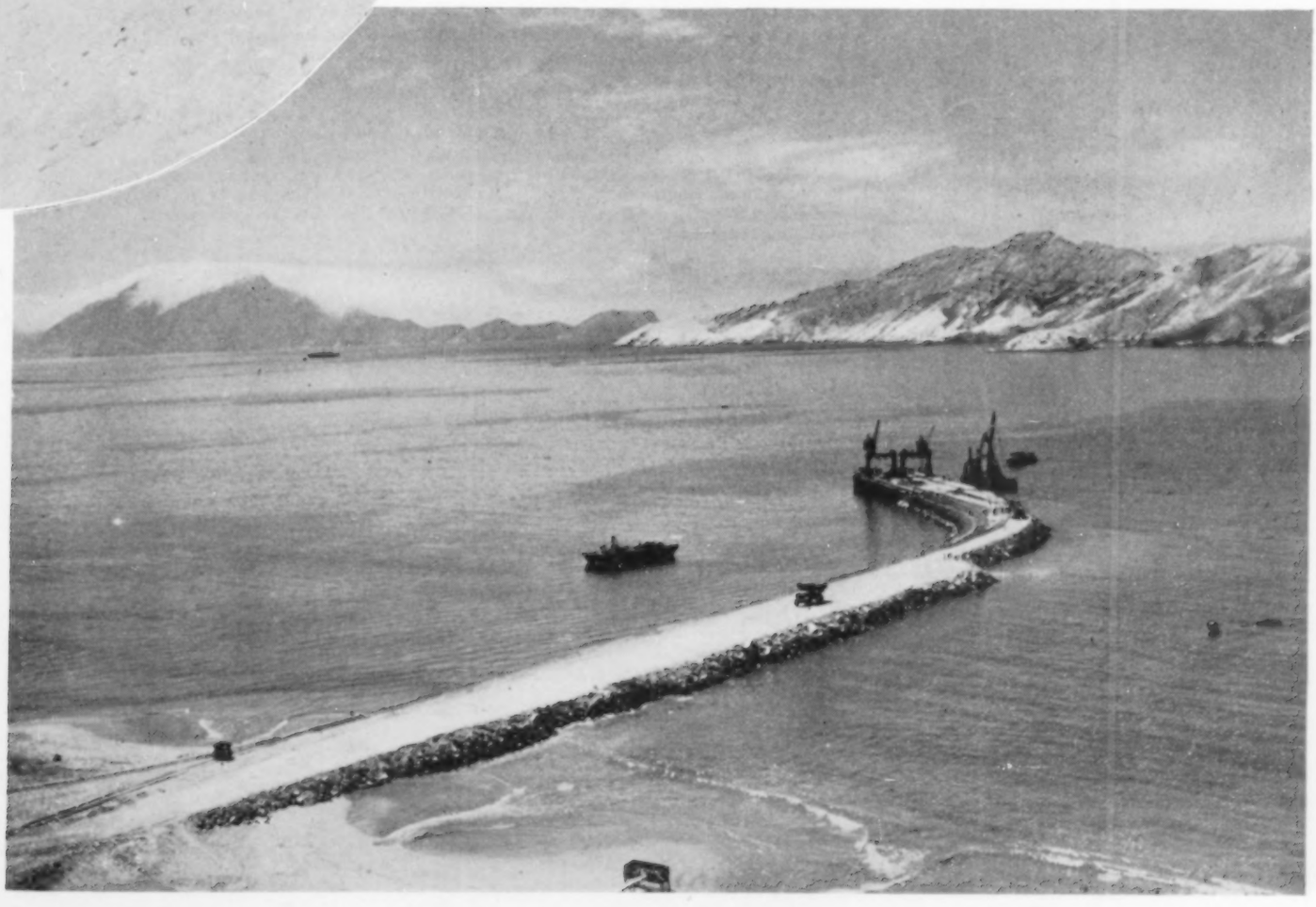
*Technical Director, Inter-American Development Commission.

power-plant site, is being extended and electrified. Some 1200 workers are employed on this job, and hand labor is being resorted to wherever possible to minimize the use of imported machinery. Barton M. Jones, a former Tennessee Valley Authority engineer, is in charge of the hydroelectric project, assisted by Andrew T. Komara, an irrigation engineer also from the TVA.

Peru's plans for bringing water to 250,000 semiarid acres on the Pacific slopes of the Andes and a little to the north of the Santa River may well become one of the really large undertakings in the Americas. Its completion would require a period of eight or ten years, and the agricultural region that would thus be created would supply the new industrial city that is expected to rise in the vicinity of Chimbote Bay following the development of power, coal mines, and other heavy industries. If the scheme to irrigate the valley should be carried out, about 100,000 kw. of additional energy might be generated by taking advantage of a drop of 4500 feet between the Santa River hydroelectric plant and the sea. Charles W. Sutton, an irrigation engineer from the United States, is acting in an advisory capacity on this project.

Chimbote Bay, which is 250 miles north of Callao and 1300 miles south of Panama, is about 7 miles long, 4 miles wide, and from 24 to 66 feet deep. It is rated as one of the finest natural harbors on the entire west coast of South America, which has few good ports. In April, 1942, construction was begun there on a modern pier which, when completed, will be more than 3000 feet long. It is to be provided with all the latest facilities for handling heavy cargo and loading steamers with coal. Sanitary work in the district was started last year by the Inter-American Cooperative Health Service and is estimated to cost around $500,000. Fuel for coastwise and foreign shipping will come from the Santa and the Chuquicara valley coal deposits 68 miles inland from Chimbote. The beds are said to be from 3 to 9 feet thick and have already been mined on a small scale. In December of 1943 about 9000 tons went to Peru, Uruguay, and Argentina.

When the harbor works at Chimbote are finished Peru will have three fine ports on the Pacific, the others being Callao, the harbor of the city of Lima, and the Bay of Matarani in southern Peru. Callao has been converted within recent years at an expenditure of more than $10,000,000 into one of the best-equipped ports on the west coast, while $3,700,000 was spent in making Matarani a modern harbor in every respect. The latter is 9 miles north



of Mollendo which, as everyone who has been there knows, is only an open roadstead exposed to the Pacific where the handling of freight and passengers by launches and barges is not only costly but oftentimes hazardous. With a wharf 1476 feet long, the bay has ample docking facilities for large steamers. The main breakwater is 2122 feet long and in places goes down to the ocean bed, 127 feet below sea level. The second one has a length of 127 feet. The channel between the two is 460 feet wide.

In order to give Peru's great southern empire access to Matarani and an outlet to the markets of the world there must still be built some 39 miles of railroad to connect the port with the main line of the Southern Railways of Peru now running from Mollendo to Arequipa. A shorter line is to provide a direct link with the town of Mollendo. War-caused shortages of shipping and materials have been largely responsible for the delay in completing these two rail connections.

Regarding Peru's production of electric power in general, it should be noted that in 1938 that country had only 210 plants of all types, with an installed capacity of 102,176 kw. By 1941, however, the number had increased to 592, with an output of 219,745 kw. Of these, 251 were hydroelectric stations with 145,420 kw., 316 were diesels with 34,594 kw., and twenty were steam plants with 39,731 kw., plus five windmills. When diesel engines and small generators and motors again become available, it is generally believed that there will be a sharp growth in power plants of moderate size, as studies show that there are scores of places without adequate electric service. A $150,000 station that was recently completed near Arequipa develops 2380 kw., doubling the power supply of that community.

Peru has been famous for her metals since earliest times, and is today the world's largest producer of vanadium and bismuth. She ranks fourth in silver output and tenth in copper, and her mines also yield lead, gold, zinc, tungsten, molybdenum, and antimony. In addition, there are deposits of mercury, sulphur, tin, and nitrate. Cerro de Pasco is one of the greatest copper mines. The Castrovirrerna region has been a producer of silver and Huancavelica of mercury. But these famous mining camps, worked for centuries and still active, represent only a part of Peru's mineral wealth. Promising copper deposits are about to be opened in the Yaruicocha district near Oroya, and so are others in the Toquepala area in the south.

There appear to be large bodies of molybdenum in the Janchiscocha section near Jauja, and the Camana mica field has started the production of sheet mica in a small way. As for lead, zinc, and silver, a mining authority recently said, "It is difficult to find any area that does not contain them." Gold has much promise in the eastern jungle regions where many rivers carry alluvial gold, some of them in commercial quantities.

Recent activities in the Peruvian mining industry include the completion by the Cerro de Pasco Copper Corporation of big coke ovens and the conversion of a lead-zinc concentrator, with a capacity of 800 tons a day, for the use of copper ores. A pilot electrolytic zinc plant, operating on an experimental basis, is now turning out 100 tons of that metal a month.

Petroleum production has been Peru's greatest mineral industry, and petroleum products, nonferrous metals, and concentrates, combined, have usually made up considerably more than half of the country's total exports and been its major source of foreign exchange.

CANYON DEL PATO PROJECT

The picture at the left shows the site of the dam that has been erected at the head of a deep gorge through which the Santa River drops 1400 feet in 5½ miles. From the dam, an 18-foot tunnel will convey the water to a powerhouse that will eventually generate 125,000 kilowatts of current. Shown below is the project village "Hidroelectra," containing offices, shops, and dwellings. The houses are of permanent-type construction and will be occupied later by the powerhouse operating personnel.

A QUARRY ON GUAM ISLAND

Mobil-Air portable compressors, wagon drills, and part of a high coral working face that was developed. At the right is an Army Engineer Negro soldier holding a drill rod with a Jackbit screwed on it. These easily detachable drilling elements have applied the safety-razor-blade principle to rock drilling. Only the bit, weighing about a pound, has to be transported to the blacksmith for resharpening. The heavy drill rod remains on the job and is used over and over by attaching sharp Jackbits to it.

How Air Helped Build a Military Base

R. P. Day

GUAM was a tranquil, sleepy island until July 21, 1944. Less than a year later the installations of a great military base had changed it to a busy American place, bustling with the business of war. The transformation was made possible, to no small extent, by native coral rock and compressed air.

Coral rock furnished the surfacing for airport runways and highways and the base-course filler for subgrades. When crushed, it was an excellent aggregate for concrete bridges. Without it, a great amount of rainy-weather work could never have been accomplished. And without compressed air for drilling, the coral rock could never have been handled so rapidly and to such good purpose. For it was air compressors and rock drills that made possible the breaking and hauling of much of the harder coral formation.

So vital was some of this work that it was assigned an unusually high priority by the island command. Air compressors, rock drills, and Jackbits were brought in with the first bulldozers. Drill steel ranked in importance with dump trucks. Air hose came ashore shortly after ammunition. The Japanese, who had worn out their welcome on Guam, never had equipment like this, even though some well-worn contractor's machinery was there for them to study.

The vaunted "Asiatic Order" administered by the Nipponese failed to improve Guam or to impress its people. The Japanese did not develop the roads. They built a crude airstrip on Orote Peninsula, using undersized tractors and rollers. All the young men of Guam were forced into this work, because Japan had never produced the machines to do it. The first big job after the Americans landed was a tremendous highway-building program. It began even before the island was secured, and much of its early success was attributable to air-powered drills and explosives which made it possible for prime movers and hauling units to move the muck out of roadway cuts.

Guam is not a tiny dot in the Pacific, as most travel books say it is. It covers 225 square miles and is 30 miles long. Compared with a coral atoll, the island is a continent. It is a clean, rugged, red-lava-bearing land of high plateaus and rocky cliffs abutting the sea. Enough first-class military highways were planned for it in the last six months of 1944 to reach from New York to Cleveland, Ohio, a distance of 536 miles.

Most of the rock drilled and shot in the roadway cuts was a metamorphosed coral, common to Guam as well as several others of the Marianas group. It contained pockets of nullipore coral and nuggets of crystal-amber calcite and weighed from 150 to 160 pounds per cubic foot. Portable air compressors with light mobile wagon

drills proved especially suitable in hurrying along much of the initial excavating. Even Jackhamers were used extensively. With each wagon drill of the Ingersoll-Rand FM-2 type there was usually a portable of 315-cfm. capacity delivering air at about 90 to 100 pounds pressure. But when Jackhamers were required, three of the JB-5 class could be operated by a compressor of this size.

In order to build wide permanent highways, it was sometimes necessary to make cuts 120 feet deep, and all these necessitated drilling and blasting. In this work compressed-air tools averaged 180 linear feet of 2½-inch-diameter hole per 8-hour shift, and once production went as high as 250 linear feet, which stood as a record. One particularly heavy cut required drilling where excavating began—at the top of a mountainside. Wagon drills were pulled up a pioneer road by cable on a tractor rear-end winch, and the compressors were moved in as close as possible to the base of the mountain. That ordinarily inaccessible spot was reached by the wagon drills only because they were portable. It is not known whether the Seabees' wagon drills were ever made to climb trees, but if they had been called upon to put holes in trees it is a good wager that they would have attempted it!

Eighteen-foot holes, spaced on an average on 10-foot staggered centers, proved adequate for most of the highway work. Where calcite was encountered the interval between holes was about 6 feet; but soft coral was loosened up and permitted an increase in shovel output with holes on 15-foot centers and loaded with a powder ratio of 1⅛ pounds to 1 cubic yard. On one such cut a 2½-yard shovel, digging as fast as possible, accounted for 80 cubic yards an hour, much to the detriment of its boom and dipper-stick assemblies. When air-operated drills and explosives were brought in, shoveling immediately jumped to 140 cubic yards an hour. After blasting, the coral loaded readily so that the dipper teeth no longer made marks against the face of the bank and shovel up-keep was reduced appreciably.

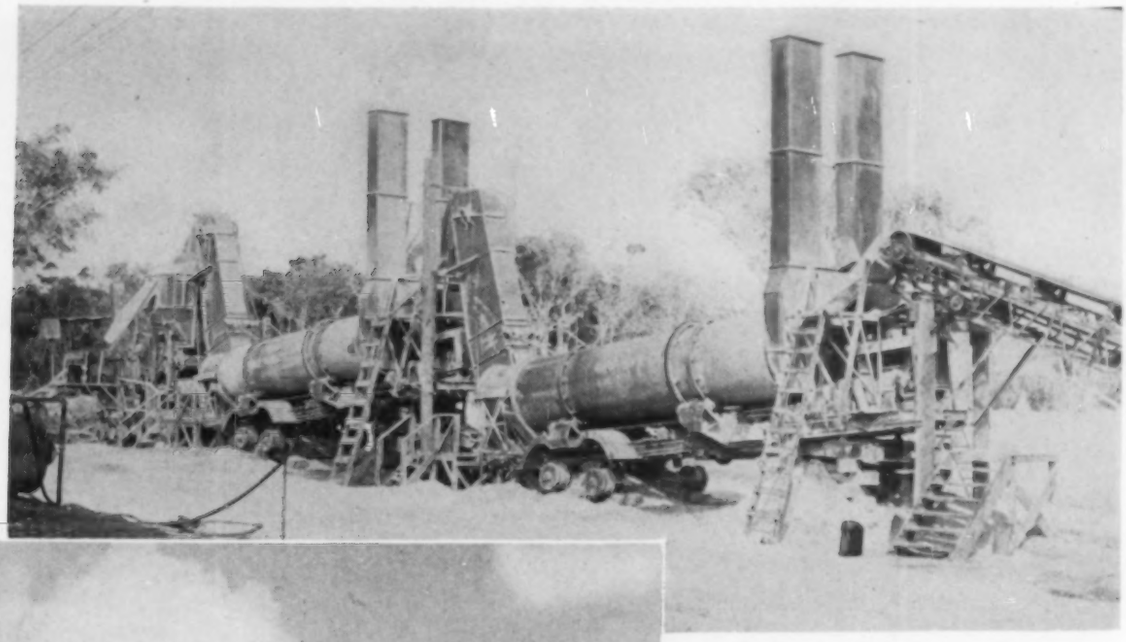
Portable compressors and Jackhamers were also used to advantage by the Seabees in shaping the ditch sections of military roads passing through rocky terrain. Many of the main arteries are 3- and 4-lane black-top superhighways, with minimum 600-foot-radius curves and 4-foot superelevation on the outside. In order to take care of the 80-inch normal rainfall, a drainage ditch had to be dug on the inside of the curve, on the low side. This always passed through solid rock when the curve was located in a heavy cut section, and drainage ditches invariably had to be excavated by the aid of drills and explosives.

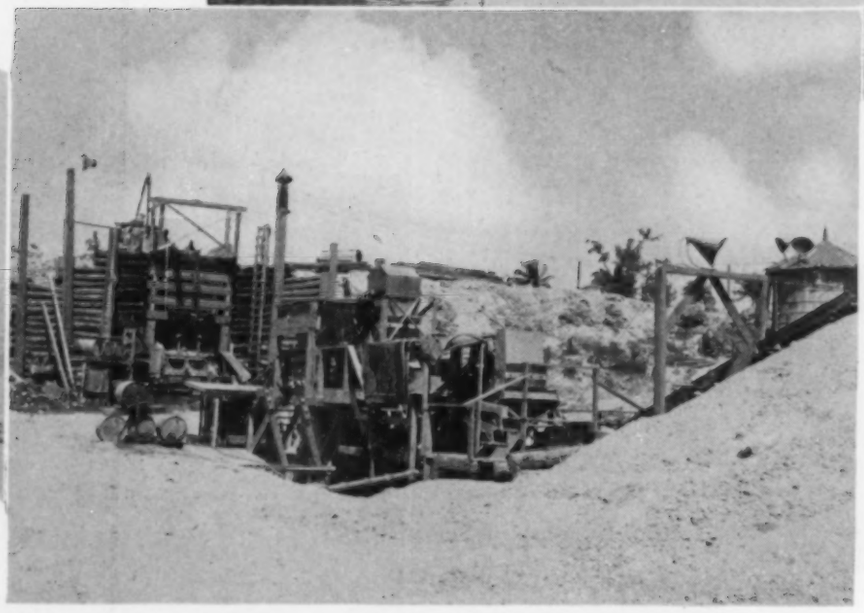
One of the heaviest jobs for compressed air on Guam in connection with earth removal was that of furnishing drill power on a big breakwater project at Port Apra. Wagon drills put in all holes 24 feet deep and less, while churn-type machines drilled holes to a maximum depth of 56 feet. Wagon drills and Jackhamers served to shape up the irregular terrain ahead of the churn drills so that the latter could be moved in and set up with a minimum of delay.

Compressors of 315- and 500-cfm. capacity were grouped, and they delivered into a common 6-inch header extending the full length of the 1.1-mile rock quarry. Air consumption was figured on the basis of 315 cfm. per wagon drill and 100 cfm. per Jackhamer. Nearly all the rock drills on the job were 55-pound Ingersoll-Rand JB-5's, machines that give good performance with a minimum of vibration and,

AMERICAN MACHINES ON THE JOB

The picture below was made in a quarry, but highway cuts presented much the same appearance. On both these types of jobs, Jackhamers (right) supplemented the heavier wagon drills. Coral rock for some uses was crushed in the Seabee-operated plant shown in the lower view on the opposite page. In it, compressed air cleaned belt idlers, greased fittings, and blew rock dust away from various places where its abrasive action was undesirable. In the Barber-Greene asphalt plant (upper right), compressed air atomized the fuel oil fed to the burners of the drier oven.





consequently, reduce operator fatigue.

Air-driven drills possessed certain advantages over churn drills at this quarry. Ground water was hardly ever present at the working sites, and fine particles accumulating at the bottoms of the holes drilled with Jackbits could be blown out much more readily with compressed air than they could be bailed out in the case of churn drills, for all the water for making mud in a churn-drill hole had to be hauled in by tank truck.

The work done by the FM-2 wagon drills was slightly better than that of the churn drills on the basis of cubic inches of hole put down in a given period. This is always an excellent comparison, for it is a direct index of the amount of the powder charge. Churn drills averaged one 56-foot 6-inch-diameter hole in sixteen hours, representing a volume of 19,000 cubic inches. FM-2's averaged 360 linear feet of 2½-inch hole in sixteen hours, with a volume of 21,211 cubic inches. More than 1,500,000 cubic yards of rock was broken by air-powered drilling equipment for the big breakwater at Port Apra, the Seabees averaging as much as 3800 cubic yards a day for a month, or 800 yards better than the contractor's 1941 estimate.

Storage areas covering up to 50 acres were excavated by modern machines, using the simple method of finding a balance point and then leveling all the topography to that grade. Easy, yes, with compressors furnishing air to drive drills into some of the toughest rock in the Pacific. Air also served its purpose in laying oil and water pipe lines. Much of the piping had to be placed below ground in rocky areas too tough for trench hoes or conventional ditchers. There wagon-drill holes, spaced on 6-foot centers and loaded with high explosives, did the trick. Often only two or three drills managed to stay ahead of trench hoes averaging 600 to 800 feet of ditch a shift. Even after the pipe lines were welded together in sections 60 feet long air played its part in lowering them to the bottom of the trenches, for the controls of many of the truck cranes used in this work were air-activated.

Huge tank farms on Guam for the storage of aviation gasoline, diesel fuel, and black oil owed their beginnings to compressed air. Space was at a premium on the island, but necessity more or less rigidly dictated just where the big steel tanks were to be located, the primary requirement being to put each one near an airfield. This could usually be done and still utilize ground useless for other purposes, such as hillsides, heavy jungles, or rocky areas. We won't enter into their construction details here because a project of this type was described in the October, 1945, issue of COMPRESSED AIR MAGAZINE.

Water tanks were set on timber towers held together by bolts inserted in air-drilled auger holes. Diesel engines in powerhouses were impotent things without starting air to set them running. Pile bents in bridges were capped in record time by air tools—by chisels, augers, and chippers. Air-operated well points produced water and dried up wet, soggy areas of ground. Faulty patches of asphalt on airfields were chipped out by means of pneumatic gads and then patched. Even the plants which produced this hot-mix surfacing needed some compressed air. One, badly in need of steam but underpowered in that respect, used air for atomizing the diesel fuel in its drier-oven burner tips, thus solving a perplexing problem.

Air was, indeed, one of the "secret weapons" of the war. Compressed and controlled by present-day improved American equipment, it proved to be a tremendously effective tool in the hands of Seabees, many of whom have since then realized their ambition to walk through the streets of Tokyo.

Bureau of Reclamation Photo.

SHOWN above is A. E. Kirstein, Bureau of Reclamation employee, using a pneumatic grinder supported by a "pressure jack" that he developed. Prior to its introduction, overhead grinding in the 18-foot-diameter steel penstocks at Grand Coulee Dam required the services of two men. Mr. Kirstein asserts that with his appliance he can equal the work of two 2-man crews using ordinary supports. The jack weighs only 6½ pounds and has three devices for changing its height. One is a tension spring on the telescoping support rod, another is a set-screw arrangement similar to that on a camera tripod, and the third is an adjustable screw at the base that rests against the basal support and has a range of two inches.

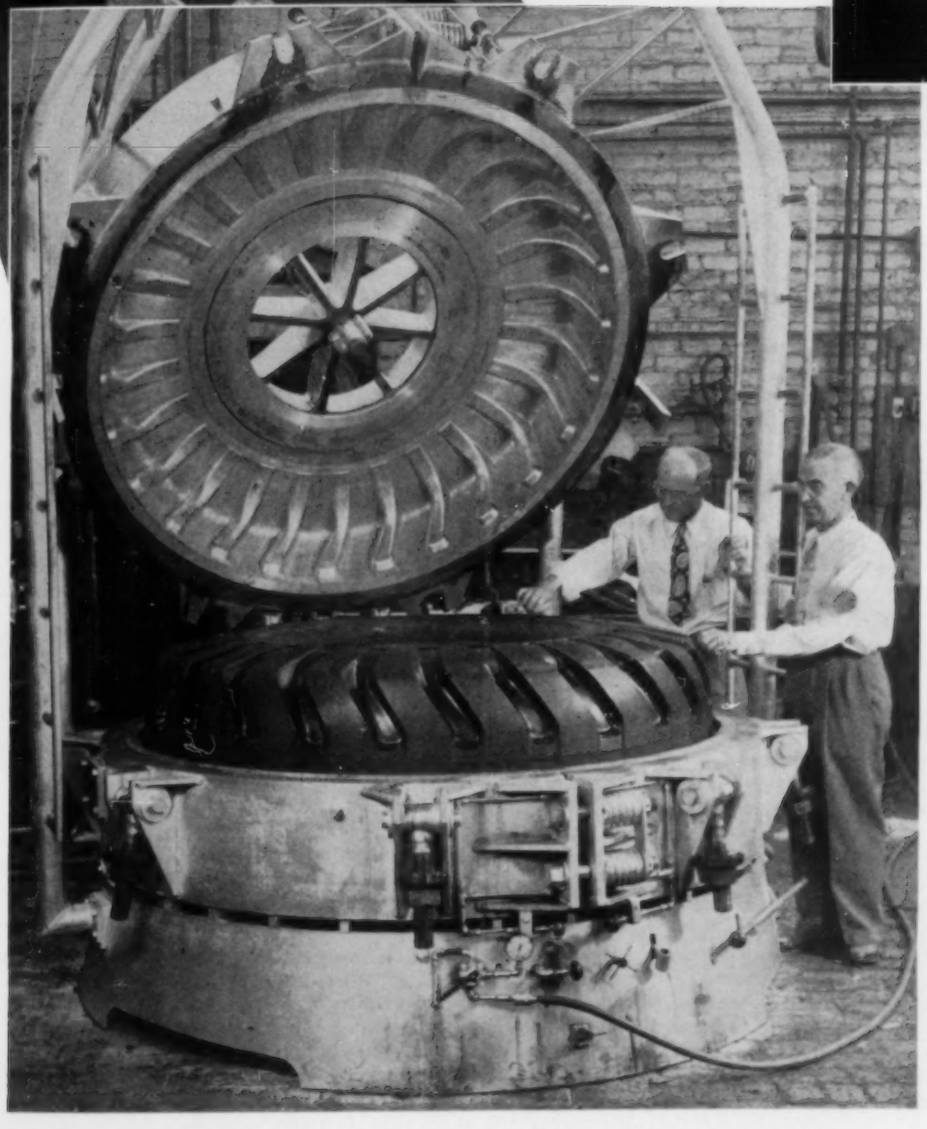
FEW TOOLS introduced in recent years have done as much to lighten labor and save time as the pneumatic impact wrench. Its job is to run nuts and cap screws on and off threaded bolts and studs. Its action is akin to that of tapping the sides of a bolt with a hammer, but the wrench delivers up to 2000 impacts per minute. With the turning power it makes available, a workman can tighten a nut or cap screw to any desired degree and can loosen or remove "frozen" ones that would otherwise have to be cut or burned off. The picture above shows a mechanic in a New York taxicab repair shop removing nuts of ⅜-inch thread size from bolts on an automotive engine. He removes 32 nuts in an average time of 5 minutes, whereas at least 20 minutes and a lot of exertion would be required to do the job by hand.

COMPRESSED *Air* AT WORK

Photograph from "Bakelite Review"

ON SOME types of military aircraft, radar units are carried under one wing. To provide protection for the sensitive instruments, special coverings called "radomes" were developed. The body of the enveloping case is made up of woven glass-fiber cloth laminated with Bakelite polyester styrene resin and is molded over a mandrel. After being cured in an autoclave, it is then ready to be removed from the mandrel for finishing. It is blown off with compressed air as shown at the left, the air being introduced through the top of the mandrel at the right end. The plastic dome is then cut to length and joined with a metal tail piece to form a complete unit.

GOGGLE cleaning in industrial plants is made easy by the Sani-Spray cabinet shown above. When a button on the front of the cabinet is pressed, a fine mist of cleaning fluid is sprayed on the goggles through a nozzle at the side. Paper tissues are provided for wiping off the fluid, which not only cleans the goggles but also fog-proofs them, thus assuring clear vision that promotes safety. The spray is produced by connecting the plant air line to a refillable quart jar of cleaning fluid inside the cabinet. An adjustable control valve limits the amount of spray delivered at each application. This appliance is made by the Allen Optical Company, Buffalo 2, N. Y.



A HUGE pneumatic tire for use on heavy earth-moving equipment is shown at the left in a mold where it has just been retreaded. This machine, one of the largest yet built, will retread tires up to 21.00-24 size and was made by the Super Mold Corporation of Lodi, Calif., for the Rogers Super Tread Service of Yakima, Wash. In the tire-curing operation, a tube is inserted in the casing, the latter is locked in the mold, and the tube is inflated to force the casing into the mold recesses while heat from circulating steam effects the curing. The air pressure used varies with the size and weight of the tire and is 235 pounds in the case of this mold.

Mobile Dental Units for the Navy

Robert G. Skerrett

A LONG pull, a strong pull, and a heave was how the men of the old Navy handled the ropes in the days of much running rigging in the fighting fleet. And the service doctors then used much the same forceful procedure in pulling aching teeth that could not be soothed by tonguing a quid of plug tobacco against them. Bluejackets and those above in rating and rank fought shy of the ship's doctor as long as they could because the removal of a troublesome tooth left a painful reminder of the operator's lack of skill and of the clumsiness of his instruments.

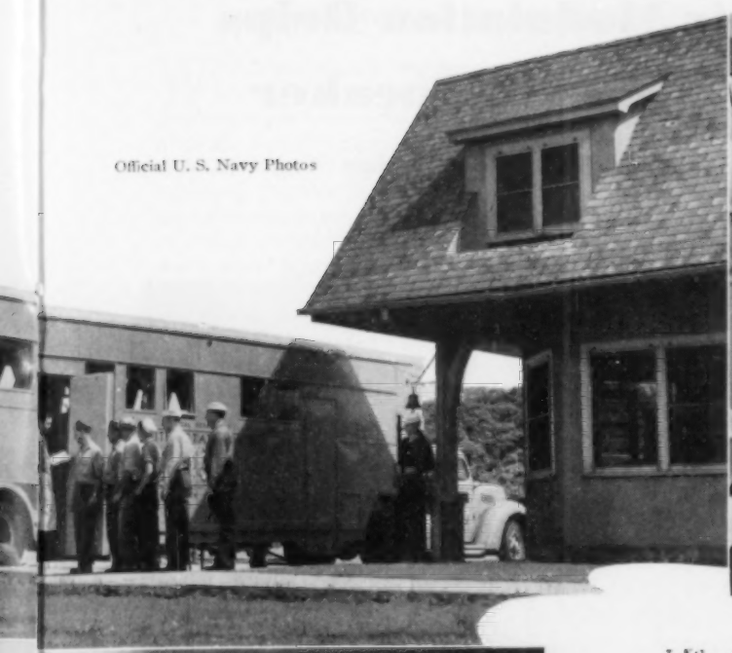
So much for a contrasting background to the skill of the Dental Corps which is now a part of the Medical Corps of the U. S. Navy. These latter-day experts not only safeguard the smiles of the men of our battle fleets but they contribute to the physical fitness of the personnel. Further, a recent innovation makes it possible for the Dental Corps to go far and wide on shore to naval stations and districts to look after the dental requirements of the men and women in Navy uniforms.

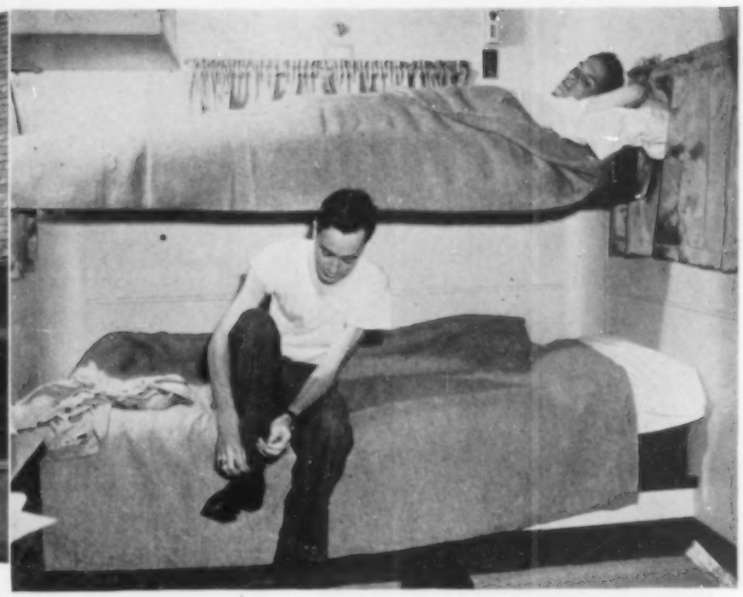
As announced a short while ago by naval authorities in New York City, "If a sailor can't get to a dentist, then the dentist goes to the sailor," and in so doing he takes along with him the best of equipment so that he can give the bluejacket the finest treatment. Such is the reason for the new mobile dental units, each of which is in the form of a motor truck and trailer with a combined weight of 14 tons and costing, complete, the good round sum of $22,000. The idea of mobile units is credited to Rear Admiral Alexander G. Lyle (Dental Corps) USN., the Navy's dental chief, and the actual engineering and supervision of construction were placed in the competent hands of Commander A. W. Borsum, (DC) USN., of the planning division of the Bureau of Medicine and Surgery of the Navy Department.

In the Third Naval District, which embraces New York, Connecticut, and the northern part of New Jersey, two mobile units were assigned to handle the dental demands of some 13,000 Navy men and women stationed where there were no provisions for naval dental treatment or where the existing facilities were inadequate. Each is designed and outfitted so that it is entirely self-contained and may be operated independently of local water and electric services. To this end there is provided a jeep gasoline engine that can be hooked up to an adjacent electric generator capable of supplying current for an X-ray machine, water and air heaters, sterilizer, lighting fixtures, and the dental operating equipment with its cauteries, warm-air and water syringes, and aspirators or saliva siphons. Current is also drawn from the same source for electric diagnostic instruments and for driving motorized machines, including the compressor which furnishes air for a diversity of purposes.

The water tank aboard has a capacity of 120 gallons, and a flow with ample "head" to all points of discharge is maintained by applying pressure to the free surface of the water. In addition, compressed air is needed in the operating room to actuate atomizers; for the driers used to prepare a cavity for filling; for the warm-air syringes that finish this preparatory work; for blowpipes that clear away particles resulting from drilling and grinding; and for the aspirators that

Official U. S. Navy Photos





KEEPING THE BITING LINES READY FOR ACTION

In the top-center picture sailors are shown lining up at the Naval Magazine at Montauk Point, N. Y., to receive treatment by traveling dentists. The inside of the trailer is illustrated below it and has all the appointments of a civilian dentist's office. While the mobile units can't go to sea, they do the next best thing by giving dockside attention to ships' crews, as seen at the extreme left. By day the rear end of the vehicle is a patients' waiting room; at night it serves as a bedroom for two of the personnel (above).

prevent an open cavity from being flooded with saliva while the dentist is busy on a filling. A puff of air also serves to blow clear the hypodermic needles that are utilized to deaden the area around a tooth to be extracted. Moisture left in them might lead to clogging or impairment. Air under pressure, if need be, can be diverted into the line leading to the pneumatic brakes of the truck should the normal supply fail for one reason or another. The air reservoir for the brakes is usually charged from an outside source.

In the operating room of the trailer are two dental chairs complete with every up-to-date apparatus and equipment. There is a dark room in which X-ray plates can be developed quickly and dried with dispatch, approved means for sterilizing instruments, in fact everything required for dental work. The personnel is made up of two dental officers, two dental technicians—the latter hospital corpsmen, and the driver of the unit. There are comfortable sleeping accommodations in the trailer for some of this group, as well as a washroom that meets every need. In the daytime, that end of the truck is the patients' waiting room.

The itinerary is arranged by an officer of the Dental Corps who is assigned to each naval district. For example, in New York State the assignments may include visits to any base where men are being trained for service in the Navy, or a unit may have to make a run to the U. S. Naval Magazine at Montauk Point at the easternmost end of Long Island, or it may have to go to any of the naval stations in New Jersey and Connecticut. Furthermore, the two units now in New York are expected to serve the waterfront of the Metropolis—to draw up alongside ships at piers to take care of the dental needs of the officers and men aboard the vessels moored there. The naval authorities are enthusiastic about the work these trailers have already done, and it is confidently expected that the new facilities will do much to improve the dental health of Navy personnel. More than that, when some of the men and women return to civilian life they will be further benefited because the dental service has made them aware of the value of prompt oral care and that the condition of the teeth greatly affects our well-being.

By the end of July of last year there were nine of these mobile units in operation within various sections of the United States, the practice being to hold a trailer at any given spot until everybody there whose teeth require attention has been treated. The dental officers assigned to the units are experienced men who are trained to do their work well and expeditiously, and the organization aboard reflects naval indoctrination and discipline. For instance, the two units in the Third Naval District were under the command of officers who were dentists in private practice in New York but who had returned from sea duty. One, Lieut. Commander Richard J. Warnecke, (DC), USN., entered the Navy in 1942 and saw twenty months of service aboard an aircraft carrier before being ordered to his mobile unit. The other was under Lieut. Harold Y. D. Bonsole, (DC) USNR., who was commissioned in January of 1943 and had served on an attack transport in the Atlantic.

An interesting side light on this new naval activity is that the Dental Society of the State of New York donated to the Navy $4000 worth of scrap gold—saved by its members—to cover the cost of certain equipment that was placed aboard the first of the mobile dental units commissioned in the Third Naval District.

Air Modulation Helps Give Loud Speaker Long Range

SMALL BUT POWERFUL

Engineers of the General Electric Company demonstrating the new loudspeaker to officers of the Air Technical Service Command at Wright Field, Dayton, Ohio (right), and to Boston fire and police officials. The system operates on the same principle as the human voice, using compressed air instead of lung power to modulate the sound. This, together with a high degree of amplification, gives the unit an audible range of 3 miles and more. The entire installation is self-contained and compact for portability and may be mounted on a small truck or station wagon.

"OLD LOUDMOUTH" is the nickname that has been given to the General Electric Company's new loudspeaker, and it certainly seems to live up to it, for it is reported to be 150 times more powerful than the average apparatus of its kind. Conventionally, it is known as Super-Aire Speaker because it transmits speech with the aid of compressed air on much the same principle as it is done by lung power. Tests and actual service have demonstrated that the speaker can project the voice under average weather conditions for a distance of 3 miles plus with a high degree of intelligibility, and it has been heard as far away as 5 miles.

Whereas it has been customary in covering large areas to use multiple-speaker installations requiring heavy-duty amplifiers with an output of many hundreds of watts, the new system is small and compact enough to be portable and, though provided with a 50-watt audio amplifier of special design, calls for the use of but 25 watts. Sound is transmitted to the Super-Aire through the medium of a microphone, phonograph record, or wire recorder, or directly and automatically by an electronic signal generator. It goes into the amplifier and thence into an airtight voice coil and valve assembly or driver unit. Simultaneously, air at approximately 20 pounds pressure also enters the coil. The air is supplied at the rate of about 14 cfm. by a compressor that is an integral part of the speaker and is operated either by a 1½-hp. motor or a gasoline engine. If the latter is used and no alternating current is available, then a generator is attached to furnish the necessary voltage for the amplifier.

When the audio frequency current passes through the driver unit, which is suspended by flexible supports, vibration is set up parallel to the coil and, in turn, causes the associate valve to vibrate in accordance with the amplitude of a sine wave form. This valve controls the compressed air and thus diverts a stream through a large number of 0.006-inch slits, modulating each separately. This combination of audio frequency current and compressed air, when converted into acoustical power, makes for a long-range high-fidelity reproducer. The frequency depends upon the system of acoustic loading and varies anywhere from 100 to 10,000 cycles.

The method of operation on which Old Loudmouth is based is similar to that of the throat and vocal cords. In other words, modulated sound is forced by compressed air to the horn, and the effect is the same as that of the voice, except that the speech is amplified to any desired degree of loudness. The output is far too powerful for close-up use, and the apparatus is not recommended for distances under 300 feet. It is serving today in military airports and navy yards, and has a wide field of postwar application in harbors for directing traffic, in railroad classification yards, in police- and fire-department operations, in flood and disaster work, on expansive construction projects—in fact anywhere where it is necessary to use a system that is capable of delivering sound at points remote from the source and of overriding high noise levels.

Excessive Air Pressure Needed to Sink Piers

WHAT may well be the deepest pneumatic caisson ever used in bridge building in the United States was required in excavating for Pier 3 in the Colorado River at Toprock, Ariz. At that point the Atchison, Topeka & Santa Fe Railroad has built a span having an over-all length of 1507 feet and resting on abutments and seven piers of two cylinders each tied together at the top by a reinforced-concrete apron. Five of the piers were sunk through water-bearing material under air pressure and have a footing not less than 2 feet deep in bedrock. At the site of Pier 3 there was an abrupt dip in the bottom, making it necessary to dig considerably deeper than had been contemplated in order to obtain a flat bearing surface for the twin 22-foot cylinders. In short, the excavation for the west-side toes of those structures had to be carried 20 feet down through the breccia rock so that the east toes might be embedded in it to a depth of 2 feet.

Before that pier reached its final resting place about 120 feet below mean water level, the air pressure under which the men worked had to be raised to 52 pounds per square inch, or 2 pounds higher than allowed under the code of the Arizona Industrial Accident Commission. By limiting the shift to 30 minutes, the contractor was granted permission to continue operations. Air from the compressor plant on shore was delivered by a 6-inch pipe line laid on the temporary wood-pile trestle across the Colorado from which the excavating and concreting were done. Because of the great heat that prevails in that part of the country in summer, part of the pipe was placed in a trough of running water so as to lower the temperature of the compressed air. Wet sacking also was used in the air-lock chambers and elsewhere to make working conditions as comfortable as possible.

Pneumatic Bomb-Bay Doors

ADDITIONAL details have now been released regarding the pneumatic equipment that is used for opening the bomb-bay doors of B-29 bombers and that was the subject of the cover picture on our April, 1945, issue. The mechanism was developed by Boeing Aircraft Company engineers to reduce the time a plane would be on its dead-course bombing run at constant speed, because it was found that too many enemy guns were getting the range during that critical interval. The new apparatus succeeded so well that the doors could be opened and closed in a total of 2.1 seconds (0.7 second for opening and 1.4 seconds for closing), as compared with the 50 seconds previously required.

The door-actuating mechanism consists of a pair of double-acting air cylinders to which compressed air at 175 pounds pressure is admitted by a remotely controlled solenoid valve, of pneumatic door latches, of a regulating valve for maintaining the system air pressure at the desired level, and of miscellaneous fittings and electric-circuit devices. The air is supplied by an electrically driven compressor built especially for aircraft service, and there is a reservoir for storing sufficient air to move the doors through four operating cycles.

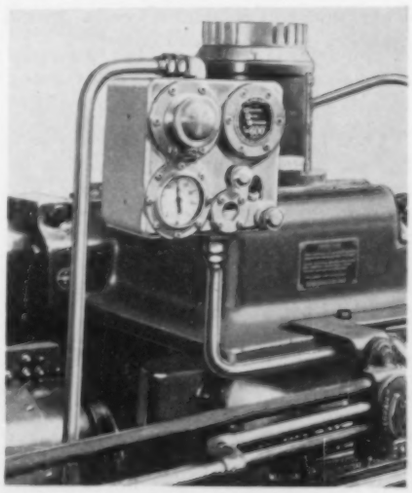
Substitution of the pneumatic equipment for the former motor-driven mechanism resulted in lightening each plane by 200 pounds, which is the equivalent of more than 33 gallons of gasoline. The control valve for admitting air to the operating cylinders was developed by Adel Precision Products Corporation and was tested at temperatures ranging from 165° to −65°F. and with air at pressures up to 450 pounds.

A Triple-Duty Air Appliance

A DEVICE for use with pneumatic equipment and that performs the triple service of regulating the air pressure, filtering the air, and lubricating a machine has been introduced by the Logansport Machine Company under the name of Logan R-F-L Unit. It includes in one casting, measuring 6x6x4¾ inches, all the individual components by which these things are customarily done and which constitute a rather awkward "Christmas tree" assembly. The unit is interposed in the air-supply line serving the machine and may be mounted either on or convenient to it or on a central control board. All the necessary connections are built into the casting, and controls, gauges, etc., are on a front panel.

The manufacturer states that the R-F-L can be used effectively with either new or old pneumatic equipment. By reason of its regulating feature it levels out surges and sudden drops in air volume and maintains a steady working pressure that insures peak machine production. Filtering the air removes rust, scale, moisture, and other unwanted matter, thus promoting unfailing operation and reducing wear on parts of machinery. Lubrication of the latter is accomplished by the continuous injection of oil mist into the air supply.

Two knobs are provided for adjusting the air pressure and the amount of oil introduced in accordance with the requirements of the equipment or the particular job being done by it. A third knob controls the opening of a drain on a reservoir into which condensed moisture drops after it has been separated from the air by the filter. The filter itself is of porous metal and is readily removable for cleaning or replacement. The R-F-L Unit is designed for use with air pressures up to 150 pounds per square inch.



IN SERVICE

This view shows a Logan R-F-L Unit mounted on a Warner & Swasey turret lathe.

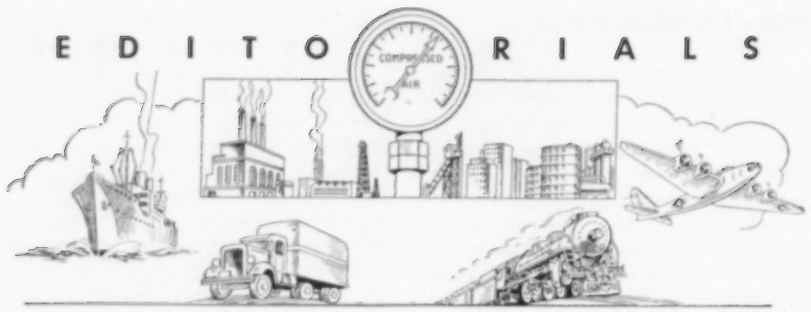
Packaged Electric Controls

PACKAGING has reached a new high in the case of a system known as Stratopax, which was developed by the Cook Electric Company during the war for its own use but which was soon pressed into service by other manufacturers. Packaging, as the term is commonly understood, means temporarily wrapping or encasing goods for shipment or storage. Stratopax goes much farther than that. It's a permanent protection—the product remains packed throughout its whole service life.

The idea was conceived primarily to eliminate the hazard of fire through insulation breakdown and excessive arcing in standard electrical controls such as relays, contactors, circuit breakers, and switches for high-altitude aircraft. It has been found, however, that it also insures trouble-free operation in areas where that is normally not possible because of weather conditions or the presence of dust, etc.

By the new method, one or more devices are hermetically sealed in a metal container. This is shaped to fit the parts and the available space; has provisions for mounting and for all necessary electrical features; and includes inspection ports, test lamps, etc. After assembly, each unit is heated to get rid of moisture which might cause corrosion, is evacuated, filled with an inert gas, and sealed. The gas introduced is high in thermal conductivity to avoid overheating in service. Additional safeguards to this end are radiating flanges and expanding bellows sections. Before it goes out of the plant, each package is tested for tightness with apparatus that can detect gas leaks which, expressed in terms of air, are as minute as one-billionth of a pound per hour.

EDITORIALS



FARM MECHANIZATION

IN SURVEYING the potentialities that different fields of endeavor offer for technological advances, one should not overlook the farming industry. Although it is the bulwark of civilization, and gives livelihood to more persons than any other line of work, agriculture is the last of our great industries to feel the influence of intensive mechanization. This is probably because the average farm is a one-man enterprise. As in a one-man shop, hand labor still accounts for much of the output. Large, company-owned farms have taken the lead in applying machinery to the various tasks at hand. Similarly, in Russia, where communal farming is practiced, mechanical aids are much used.

The postwar era is bound to bring acceleration to the farm-mechanization movement in the United States. Except in the South, adequate farm labor is becoming an increasingly grave problem. Here, as elsewhere, necessity will prove to be the mother of invention and machinery designers can be counted upon to provide additional apparatus and devices to swell the per-man production. The need for this is especially important in view of the prospects that a considerable proportion of American agricultural output must be sent abroad for some years.

Mechanization tends to increase the production per acre as well as per man and is accordingly of vital significance in nations of dense population. It is consequently not surprising to find the relatively congested British Isles turning eagerly to farm machinery. Britain's belt was drawn tight during the war period and she still hasn't been able to let it out many notches. She realizes keenly that her soil must be made to grow more of what she consumes, and mechanization offers one way of accomplishing this. Already the British claim the leadership in this respect, with more than seven tractors to every square mile of arable land and more than two for every square mile in the islands. The mechanization movement there is headed by the National Institute of Agricultural Engineering and one of its principal goals has been the development of machinery suitable for use on small farms. Power-driven equipment for harvesting grains and sugar beets, for digging potatoes, and for drying and handling grains have been produced and are being demonstrated with the hope of getting farmers to adopt them. Similarly, improved plows, harvesters, and cultivators have been developed, and better ways of using them are being taught.

In the United States, the manufacture of farm machinery will be a billion-dollar-a-year business for the next several years. The demand for tractors alone is forecast by one authority as 250,000 a year for the next five years. There are already some 2,100,000 agricultural tractors in service, which is reflected by a decrease in draft animals from 24 million in 1921 to 12 million in 1944.

Typical of the many new farming machines that may be expected to appear is the Rototiller, which prepares the ground for immediate planting by churning and crumbling the soil with rapidly revolving steel tines. In the Willow Run plant where Ford made Liberator bombers throughout the war, the Graham-Paige Motors Corporation is now preparing to build 50,000 Rototillers during its first year of full production.

Compressed air equipment has proved to be adaptable to so many applications in industry that it is bound to serve useful purposes on the future farm. A start has already been made in its employment for spraying and dusting crops and for drying hay. However, almost a virgin field awaits the efforts of the pneumatic designer, and will no doubt receive careful attention in the years to come.

AIRCRAFT RESEARCH

DESPITE the phenomenal progress it has made to date, the aviation industry is probably only getting well started. Some authorities say it now occupies about the same relative position that the automobile industry did in 1910. That is to say, the period of greatest growth is yet to come.

The manufacture of planes was big business during the war, and with the emphasis on production rather than on costs it was possible to register technological advances that would normally have taken decades. However, not all the problems have been solved and new developments will come slower under the decelerated pace of a peacetime economy. The 1946 aircraft production in this country is expected to aggregate a value of only about 6 percent of the 16-billion-dollar peak output reached during the war. Even though it will still be three times the volume of prewar 1939, manufacturers say it will not be sufficient to support an extensive research program. The Air Coordinating Committee of the Army, Navy, and Department of Commerce has recommended a minimum annual output of from 3000 to 5704 military planes as a base for expansion in case of a national emergency. The first of these figures represents a rather small increase over the 1939 output of 2141 military planes, and it remains to be seen whether the actual production will be great enough to support essential development and "pilot-line" production costs.

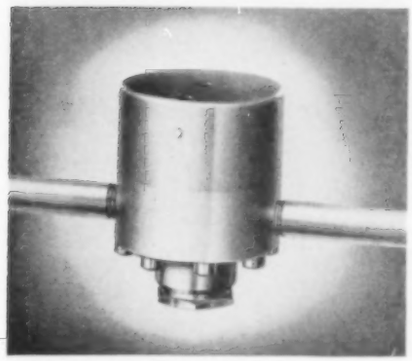
When viewed from the non-military side, the outlook is better. Our domestic airlines are flying some 550,000 miles daily, or 51 percent above the 1941 average, and are steadily adding to the total as new transports are placed in service. There is also a huge expansion in "feeder" line service in the offing, the aim being to make commercial flying facilities available to the 90 million Americans who are not now living in close proximity to established air lines. The Civil Aeronautics Administration predicts that ten years hence our transport services will be carrying twenty million passengers annually within the country and an additional two million in foreign operations.

The transition from wartime to peacetime production is a big and expensive step for the manufacturing concerns. A hint of what it involves is contained in the announcement by the Bendix Aviation Corporation that it expects to spend 25 million dollars on its reconversion program. It is significant to note that its plans include the development of instruments and appliances for the personal airplane.

In an effort to pave the way for handling greatly increased quantities of air cargo, the 23 United States flag airlines have organized a Shippers Research Division. In addition to promoting safer flying, its studies will seek to develop packaging methods for all types of airborne goods that will insure their reaching their destinations in undamaged condition. One of the principal lines of investigation will be aimed at determining the effect of changes in air pressure on various cargo items. This will involve experimentation in pressure chambers where atmospheric conditions at various altitudes can be simulated.

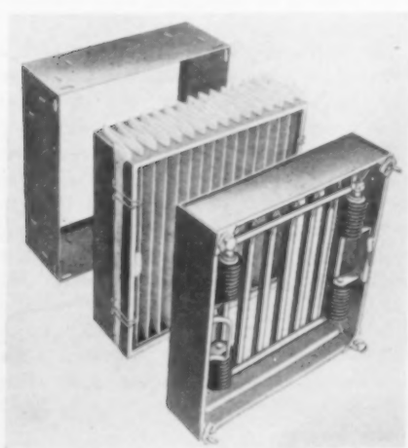
From this program it is expected to obtain information on the proper packaging of various materials that are now listed as hazardous. These include flammable, magnetic, and radioactive materials, and those producing toxic, noxious, and corrosive fumes. Present knowledge indicates that it will be desirable to develop a vaporproof self-pressure-equalizing container for flammable liquids.

Industrial Notes

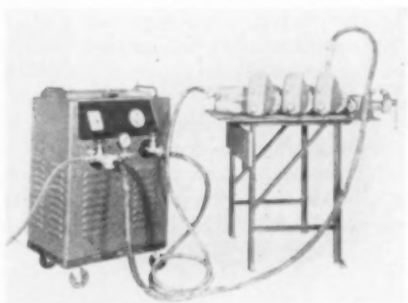


Originally developed for wartime service—for controlling the actuating medium of rockets and pack-type flame throwers, the pressure-reducing regulator for air and gases shown in the accompanying illustration is said to have a capacity range equal to that of units ten times its size. Measuring approximately 2¾ x 3¼ inches and weighing 2 pounds, it is suitable for handling initial pressures up to 3500 pounds with an adjustable control range of 5 to 1500 pounds. Special models can be supplied for a maximum initial pressure of 5000 pounds, and also for liquid service. The Mity-Mite, as the regulator is named, is made of duralumin and has stainless-steel ports. It is a product of the Grove Regulator Company and is available for ⅛- and ¼-inch piping.

American Air Filter Company has announced an addition to its line of electronic air filters that is said to be based on a new principle in the field of electronic air filtration. The unit—the Electro-Airmat—uses a collector element made of paper and trade-named Airmat. This material is built up of a number of porous tissuelike plies of short cellulose fibers in jackstraw arrangement. When an electrostatic charge is applied to the element the plies tend to separate and each fiber becomes an electrode that attracts and holds dust and smoke particles. When the paper has accumulated its dust load it is replaced with clean paper by turning the crank of a mechanical device which folds the material in conformity with the serrated base section of the filter. Spare cells with fresh Airmat can be provided for convenience in servicing. Where only a few units are required, a manual loader suffices. It is claimed that tests by the discoloration method, using a standard 24x24-inch unit with a rating of 1000 cfm. and with a normal flow through the collector element of 35 fpm., give the Electro-Airmat an "arrestance" rating for atmospheric dust or smoke of 90 percent and better.



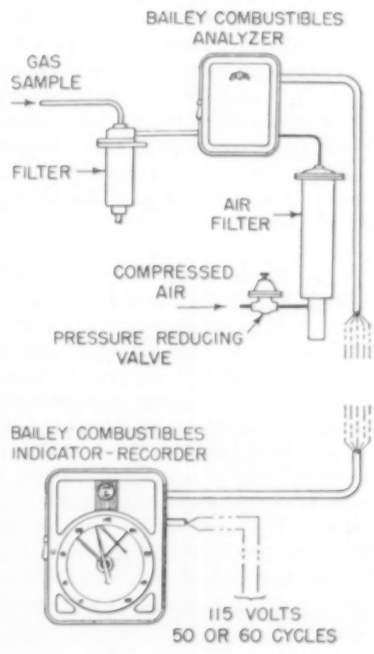
Making defective castings sound so that they can withstand operating pressures is the purpose of a portable unit developed by the Metallizing Company of America. Known as the Mogul Circulator M-1500, the equipment uses Mogul Cast-Seal, a special solution that is said to contain no deteriorating or dangerous gas-forming substances. It is applied hot under pressure and, as it circulates, penetrates cracks and porous areas where, because of the colloidal action of its base, it quickly forms metallic bonds that effectually seal the openings. The unit permits servicing two or more connected castings at one time and can test them for tightness with compressed air taken from a shop line. It is claimed that castings so salvaged have shown no signs of leakage when subjected to kerosene, hot oil, water, etc., under 200 pounds pressure.



Marked interest is being shown by American colliery operators in a radically new coal-cutting machine developed by the Nazis. It was discovered by one of the U. S. Government intelligence groups sent abroad to study German methods and machinery for the benefit of home industries. The equipment works on the principle of a carpenter's plane and shaves a slice 1-foot thick and 750 feet long from the face of a coal seam. The slab is cut from the lower third of the seam, thus causing the upper two-thirds to cave and fall over the machine into loading troughs. The planer is 15 feet long and is really two units operating in tandem. Each is equipped with a manganese-steel, plowsharelike blade, the two cutters facing in opposite directions so that a slice can be removed each trip as the machine shuttles back and forth. Pulling power is provided by an electric or air-operated hoist using wire rope. It is reported that the planer can mine 800 tons of coal a day.

Although engineers' slide rules have been in use for 300 years, the first one that will place the decimal point at the end of a long and intricate computation has just been introduced by Pickett & Eckel. Called the Deci.Point, it will determine the precise location of the decimal point in involved expressions up to nineteen places. Other advantages over conventional slide rules are also claimed for it.

Bailey Meter Company is offering a new analyzer and recorder that automatically and uninterruptedly controls and graphically indicates the combustible content of a gaseous mixture. By means of it, a continuous gas sample is mixed with compressed air and burned on a catalyst filament, which reaches a temperature proportional to the contained combustibles. Because the filament resistance is a function of temperature, a simple resistance bridge connected to a null-balance electronic recorder completes the installation. Pneumatic-control or electric-alarm contacts may be provided for 1- or 2-pen recorders. In the case of the latter, separate analyzers are used so speed is not impaired by switching, and independent records are available. The instrument is said to be responsive to changes in combustibles of 0.05 percent and to be accurate to within



0.25 percent. It is being utilized for the precise control of furnace atmospheres and chemical processes, as well as for measuring the combustible content of gases in petroleum, metallurgical, automotive, and chemical industries.

Here's a neat container for shops where glue and coatings of one kind or another are used intermittently. It's built of heavy aluminum and has two desirable features: a snugly fitting top that covers

both the contents and the brush to prevent evaporation and hardening, and a removable crossbar to wipe surplus material from the brush and upon which to hang it when not in use. The can comes in 1- and 2-quart sizes and is made by Kindt-Collins Company, Cleveland 11, Ohio.

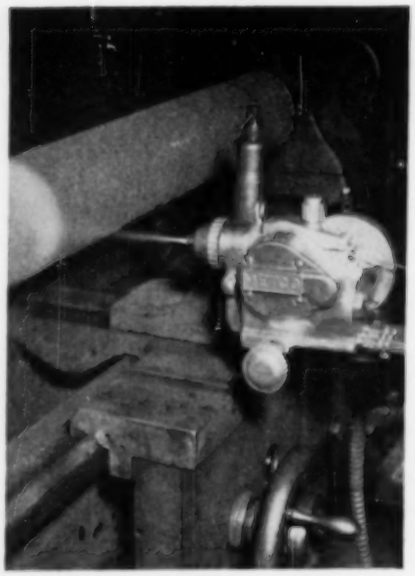
Metalsorter is the name of a machine developed by the Farmers Engineering & Manufacturing Company for the purpose of identifying ferrous and nonferrous metals and alloys. The equipment is portable and operates on the triboelectric principle. A known or acceptable specimen is rubbed against one of unknown or doubtful character, and if there is a metallurgical or chemical dissimilarity between the two, a minute electric current is generated and registered on the calibrated scale of an indicator. If pieces are alike in composition no current is recorded. The machine is plugged into a lighting circuit and is equipped with a control unit connected by a multiple-conductor cable to a reciprocating fixture provided with a specimen-holding chuck and a flexible lead to connect it with the metal to be identified. The Metalsorter is designed to test finished products of well-nigh any shape.

As the result of war experience with equipment used in cooling highly concentrated sulphuric acid from 475° to 175°F. and lower in making high explosives, the National Radiator Company has developed a U-cast hairpin cooler element for peacetime application. The new unit is said to be suitable for cooling any liquid, but is especially adapted for service in connection with acids or strong alkalies. The sections are cast of gray iron, which is highly resistant to both the solutions and their fumes. The coolant is usually water and is passed through the element, which is submerged in the bath. According to the manufacturer, the coils that were formerly used in the acid-cooling vats of munitions makers had to be completely replaced at least every three months, while the new elements in the same tanks show no signs of corrosion either above or below the liquid level after months of service. The cooling capacity of the latter is said to be as satisfactory as that of the displaced unit.

Spilled acid, oil, grease, chemicals, and other liquids can be readily soaked up, it is claimed, by Super-Absorbit, a mineral product that absorbs 392 percent of its weight in water and 315 percent in oil. It is a very light noninflammable, dielectric material and is offered by Alexite Engineering Company.

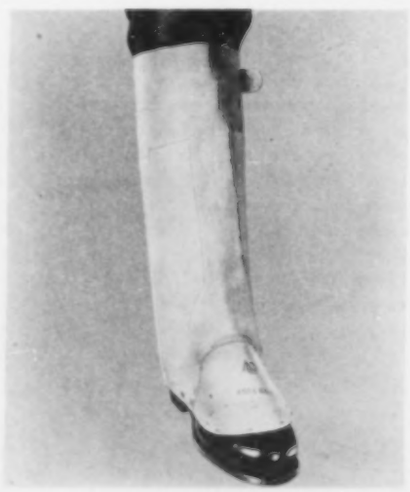
Having passed the test on fighting ships for which it was designed, the 50-watt shock-absorbing incandescent bulb of the General Electric Company is available for such services as lighting machinery and areas exposed to vibration or sudden impacts. The lamp differs from the ordinary type in that a thick rubber band fits tightly around the neck from the screw base to the glass, which it overlaps just a little. This simple cushion, we are told, enables the light to withstand shocks of 2000 foot-pounds and more.

A metallizing gun designed for mechanical mounting and continuous operation, in contrast to the hand-held types previously available for intermittent use, has been introduced by The Metallizing Engineering Company. It is called the Metco Type Y. As weight is not important in a mounted machine, the new model has been made larger and heavier than hand-held guns, with a consequent gain in sturdiness and durability of its wearing parts. A ⅜-inch wire is fed to the nozzle, where melting temperature is provided by gas under pressure. A built-in force-feed pump supplies bearings with lubrication regardless of the machine's operating position. The accompanying illustration shows one of the guns mounted for spraying metal on a rotating shaft.



By welding short pieces of 3-inch-diameter, cold-rolled steel to the treds of a crawler tractor, the contractors constructing the Horseshoe Dam on the Verde River in Arizona converted the vehicle into a tamper. It was utilized to compact layers of earth fill in building cut-off walls in the bed of the stream which, at the dam site, flows through a narrow gorge that precluded the use of a standard sheep's-foot roller with its large turning radius. With the improvised equipment it was possible to work to within a few inches of the walls and to reach all but the most inaccessible corners. Those sections were finished by pneumatic hand tampers.

All of us who have walked through a moving train know how hard it is to open the heavy doors between cars. We hear that something has been done about it—that a mechanism has been devised that will magically do the work for us. The power by which it is actuated is compressed air, which is drawn from the same source that supplies the air-brake system with which every train is provided. The equipment was developed by the National Pneumatic Company and is a combination opener and closer that functions automatically as soon as anyone comes along and gives a door not much more than a light touch.



SAFETY FIRST

Complete leg protection from instep to knee is offered by this new legging designed by the American Optical Company. It is intended for foundrymen and other industrial workers and is made of asbestos, fire-resistant duck, or chrome leather specially tanned to resist heat and splashes of molten metal. The flare over the instep is of chrome leather. A shorter variety or spat is available for instep and ankle protection.

Industrial Literature

The Bellows Company, 861 East Tallmadge Avenue, Akron 10, Ohio, has issued a new bulletin, *Bellows Air Motors*, which is available upon request. These small pneumatic devices may be applied to a wide range of operations involving pulling, pushing, or lifting.

Spot conveyors are portable units that can be moved about readily and "spotted" where needed. A succession of units can be arranged to reach into railroad cars or remote corners of factories. A new bulletin describing conveyors of this type, The Power-Flex, is available from Island Equipment Corporation, 101 Park Avenue, New York 17, N.Y.

A *Guide Book for Industrial Designers* has been issued by The B. F. Goodrich Company, Akron, Ohio, to suggest applications of some of its rubber and synthetic products. Pertinent facts are given concerning Koroseal, Vibro-Insulators, and rubber-lined equipment; molded, extruded, and lathe-cut rubber; synthetic rubber and plastic products; as well as anode rubber coverings, a new pressure-sealing zipper, water-lubricated cutless rubber bearings, belts, adhesives, sponge rubber, hard rubber, and sheet rubber.

A folder describing Flexigrip tube fittings is offered by Gustin-Bacon Manufacturing Company of Kansas City, Mo. The fitting consists of four parts and is available in brass, aluminum, or steel. It is claimed that its use eliminates end preparation and soldering of tubing and produces strong, leakproof, and flexible joints. Pump and compressor tubing are among its numerous fields of application.

Draw presses used for forming shell shapes are commonly equipped with a pneumatic die cushion that will develop a draw-ring holding pressure equal to one-sixth the total press tonnage. On the average inclinable press it is usually necessary to resort to a tandent-type installation because the press-bed opening is not large enough to accommodate a single cushion that will develop sufficient holding pressure. Dayton Rogers Manufacturing Company, 2835 Twelth Avenue South, Minneapolis 7, Minn., has issued three sheets containing data for figuring the size and capacity for most inclinable presses. It is stated that this is the first time such information has been offered.

During the war the Pittsburgh Corning Corporation developed Foamglas—a cellular glass product—for use as a flotation agent in life rafts, etc., and as a heat-resisting insulating material in ship construction. It is now being offered as an easily applied and effective insulation for tanks, towers, and ducts especially in petroleum refining and chemical industries. Foamglas is made by heating ground glass and finely divided carbon in a mold. High temperature causes the mixture to expand into a black foam that fills the mold. Upon cooling it solidifies into a block of cellular structure, every cubic foot of which contains more than ten million cells of inert gas hermetically sealed in pure glass. It consists of approximately fifteen parts gas and one part glass and is therefore exceedingly light. The material withstands fire without destruction or loss in weight and is unaffected by moisture. Blocks can be molded with straight or curved sides, thereby facilitating their application to structures of varying contours. A descriptive bulletin that includes engineering data may be obtained from the manufacturer at 632 Duquesne Way, Pittsburgh 22, Pa.

MEMO

Find out today about Naylor's advanced pipe coupling methods that save time, work and money

WRITE FOR YOUR COPY OF THE NEW NAYLOR CATALOG TODAY

Naylor

LOCKSEAM SPIRALWELD PIPE

NAYLOR PIPE COMPANY
1245 East 92nd Street
Chicago 19, Illinois

A.P.I.—A.S.M.E. and A.S.M.E. CODES • CARBON STEEL AND SPECIAL STEEL

WELDED PRODUCTS by Vogt

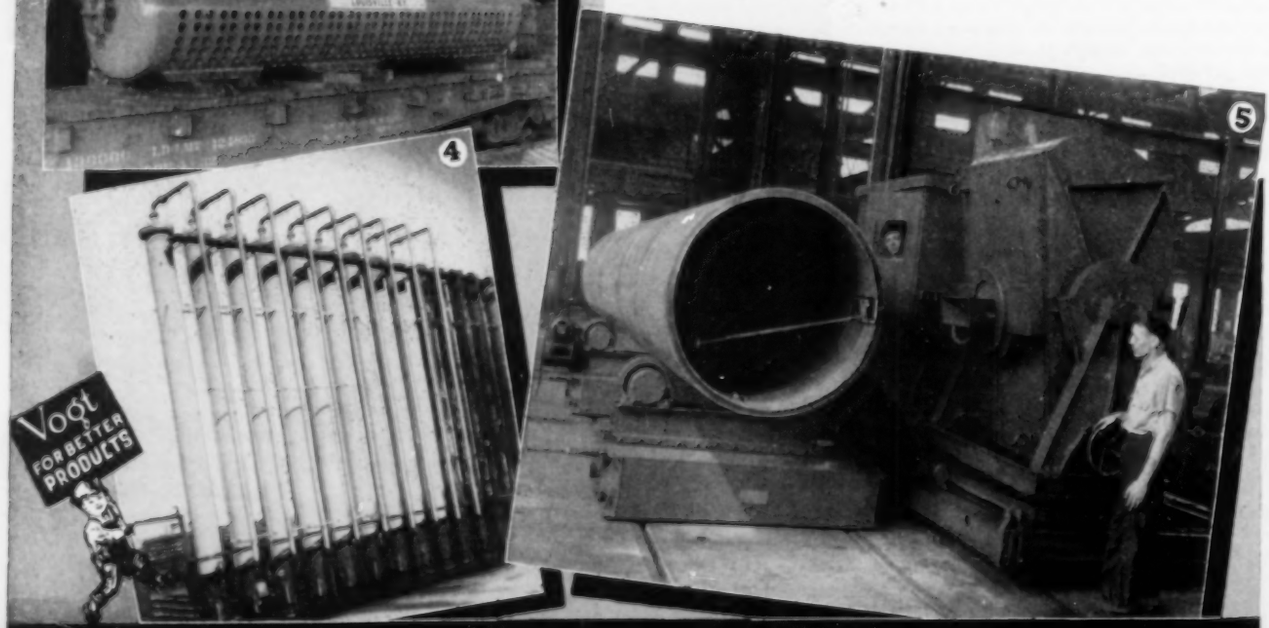
1 - 4′—0″ dia. x 7′—6″ dia. x 82′—5″ high Stabilizer Tower for a Texas Refinery. Fabricated to A.P.I.-A.S.M.E. Code, stress relieved and X-rayed. 250# working pressure.

2 - Heat Exchangers, for an Eastern Refinery, on the testing floor. Units have fusion welded Monel Metal shells and were built to customer's specifications.

3 - 48″ dia. x 22′—6″ long mud drum for a Vogt Water Tube Boiler designed to operate at 450# S.W.P. Fusion welded to A.S.M.E. Boiler Code.

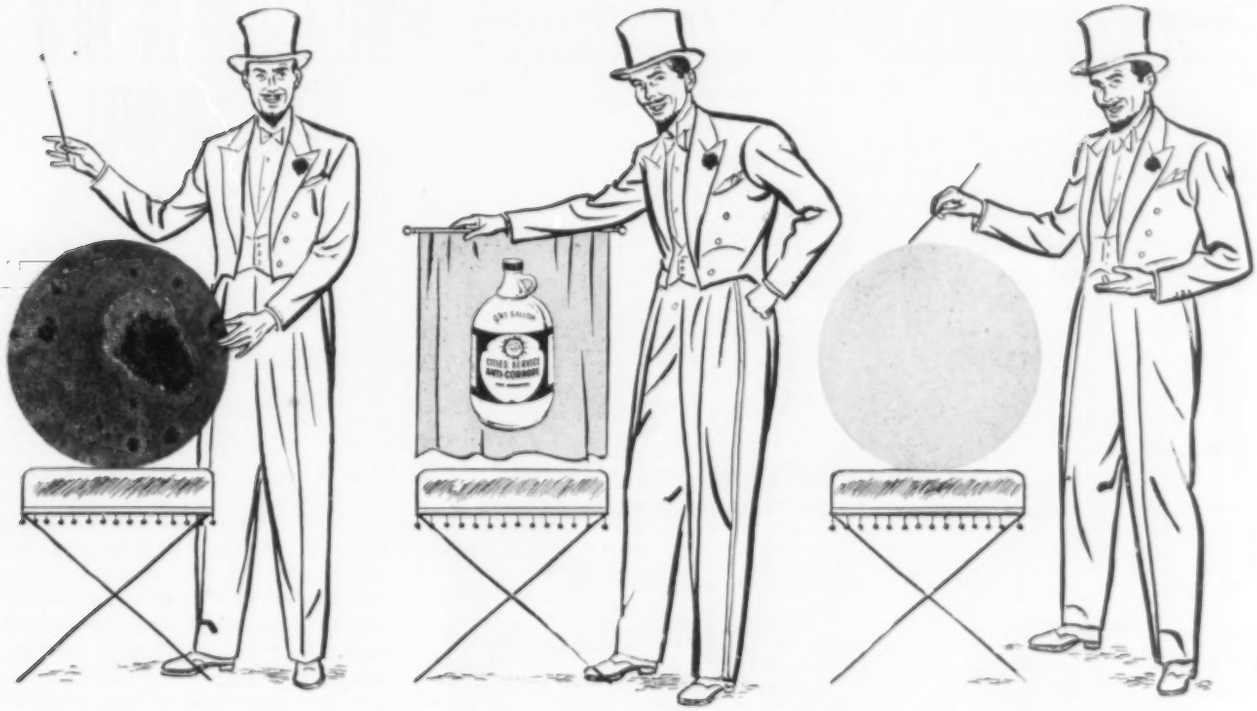
4 - Battery of Absorption Columns in a Western Refinery. Units are 33″ dia. x 41′—0″ high and were stress relieved after welding.

5 - 400 KV Industrial X-ray unit in our plate welding department. Exographs of welded seams can be quickly made because of the special motor operated rolls and traveling carriages which are adjustable to vessels of any size.



HENRY VOGT MACHINE CO.
Incorporated
LOUISVILLE, KENTUCKY
BRANCH OFFICES: NEW YORK · PHILADELPHIA · CLEVELAND · CHICAGO · DALLAS

Now you see it_Now you don't



What you see is a close-up of rust formation, Industry's $100,000,000 annual toll. What you *don't* see is its quick elimination with CITIES SERVICE RUST REMOVER.

Converting your rust liability into profit isn't magic . . . it's made possible by Cities Service Rust Remover—an effective product—proved in scores of industrial plants. Easy to apply—inexpensive—can be used over and over again with little waste.

Once you have cleared your machined parts of rust, the next step is to protect them against further rusting. Then you will want one of the Cities Service Anti-Corrodes to provide an impenetrable film that really protects. One of our Lubrication Engineers will be glad to help you select the right one. Write, wire or phone our nearest office or . . .

Cities Service Oil Co.
Room 569, 70 Pine Street, New York 5, N. Y.

Gentlemen: Please send me full information on Cities Service Rust Prevention Plan.

Name .....

Title .....

Company .....

Address .....

City ..... State .....

MAIL THIS COUPON TODAY

CITIES SERVICE OILS
ONCE-ALWAYS

LOOKING for TROUBLE!

Designed to stand up in trouble spots, America's newest and widest line of V-Belts — Allis-Chalmers' Texrope — solves every one of these drive problems.

I FIND MY PLACE WHERE EXPLOSION IS A DANGER. I'M SUPER-7 STATIC RESISTING; MY BUILT-IN CONDUCTING ELEMENT CARRIES CHARGES TO THE MACHINE WHERE THEY'RE GROUNDED

Texrope V-belts are available nation-wide through Allis-Chalmers Dealers and Sales Offices. It pays to make Allis-Chalmers your V-belt drive headquarters.

ALLIS-CHALMERS

Texrope Super-7 V-Belts result from the cooperative research of two great companies—Allis-Chalmers and B. F. Goodrich—and are sold exclusively by A-C.

A 1962

BULLETIN!

SPEED RECONVERSION WITH HELP OF NEW FREE A-C KIT!

Guide to "How to Take Reconversion Inventory" of Drives, Motors, Pumps

Help in the big job of reconverting for peacetime production is now offered to plants everywhere by Allis-Chalmers Mfg. Co., its district offices and distributors. To all who request it, we're sending the new "Reconversion Inventory Kit", planned to speed the task of determining the condition of your existing equipment — V-belt drives, motors, and centrifugal pumps — which will be used in reconverted production.

SUGGESTS PROCEDURE, STATES STANDARDS

Used by foremen, maintenance men, and engineers, the Kit is a real time-saver . . . leads efficiently to probable trouble spots, helps clear them up. Gives bearing tolerances, resistance formulae, etc., in compact, easily-used form. Check List appraisal charts help determine present and future condition of units inventoried.

HOW TO GET YOUR KIT

For your free Reconversion Inventory Kit, call your nearest Allis-Chalmers distributor or district office, or write Dept. 136, ALLIS-CHALMERS MFG. CO. Milwaukee 1, Wis.

ALLIS-CHALMERS MFG. CO.
Dept. 136, Milwaukee 1, Wis.

Please send Reconversion Inventory Kit free of charge to:

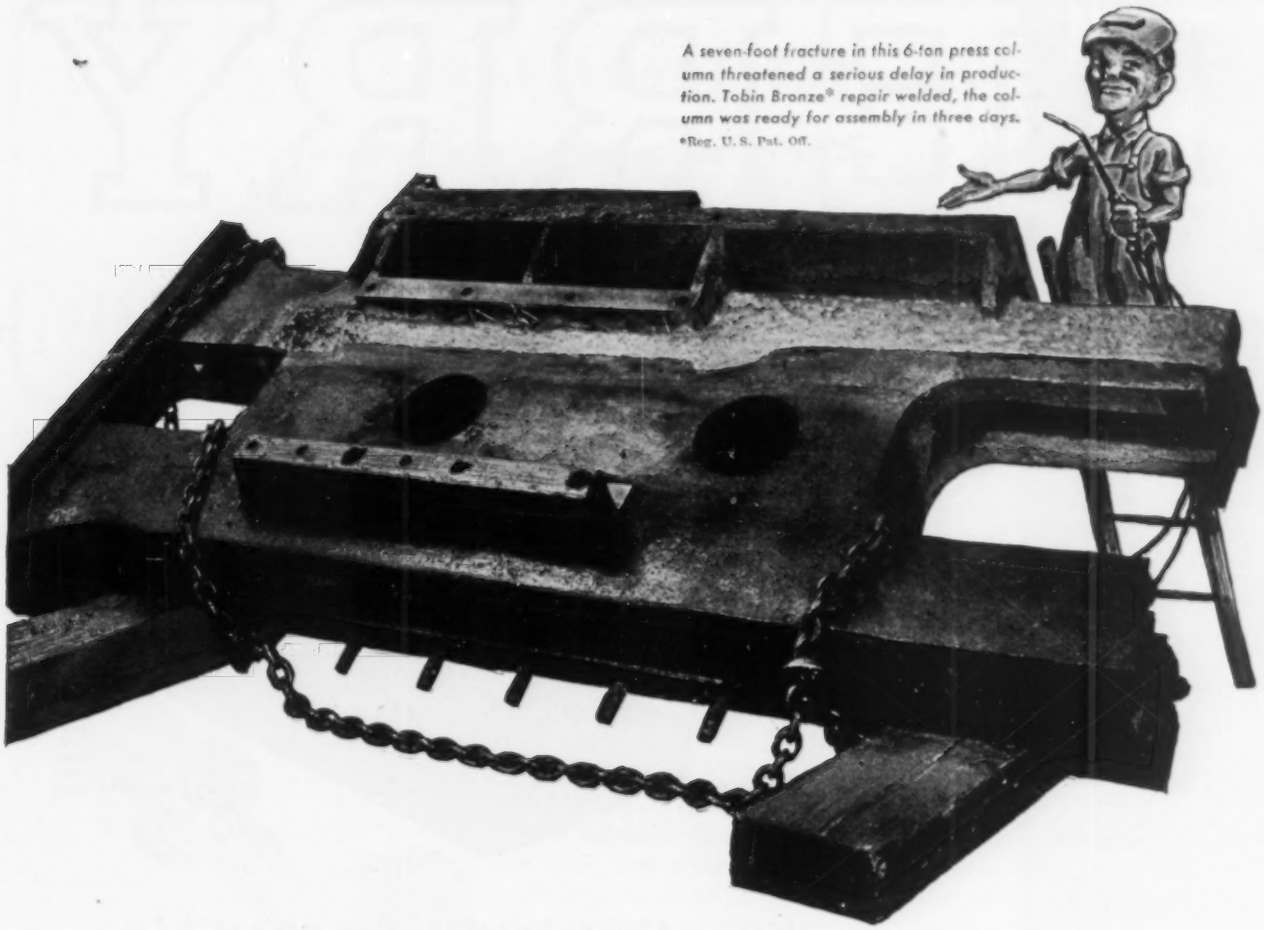
Company.....

Address.....

.....

Attn. of Mr.....

HEAR THE BOSTON SYMPHONY: *Every Saturday Evening, American Broadcasting Co.*



A seven-foot fracture in this 6-ton press column threatened a serious delay in production. Tobin Bronze® repair welded, the column was ready for assembly in three days.
®Reg. U. S. Pat. Off.

Bronze Repair Welding becomes increasingly important

WITH REPLACEMENTS taking weeks or months, Bronze repair welding is being used on an ever-increasing scale for reclaiming broken, fractured or worn equipment.

Bronze welding is not new. For years this method of low-temperature repair welding has been used by many shops to salvage costly machine tools, production parts and equipment, and for building up worn surfaces.

Almost any part made of cast iron, steel, malleable iron or copper alloys can be Bronze welded quickly, dependably, and at a fraction of the cost of new replacement parts. For detailed information on Anaconda Bronze Welding Rods, write for Publication B-13. 45105

ANACONDA

Anaconda Bronze Welding Rods

THE AMERICAN BRASS COMPANY—General Offices: Waterbury 88, Connecticut

Subsidiary of Anaconda Copper Mining Company • In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

TERRY

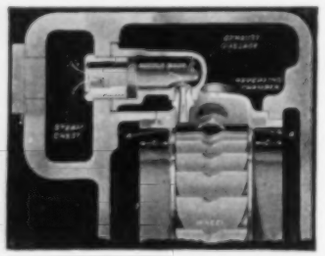
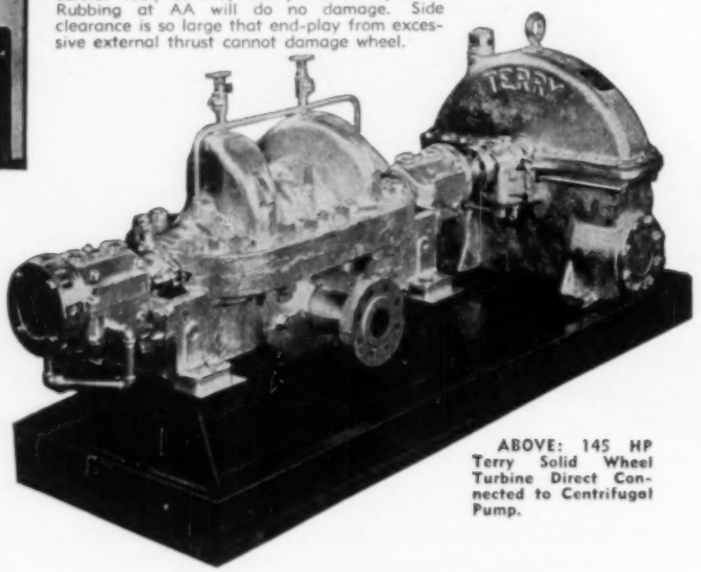
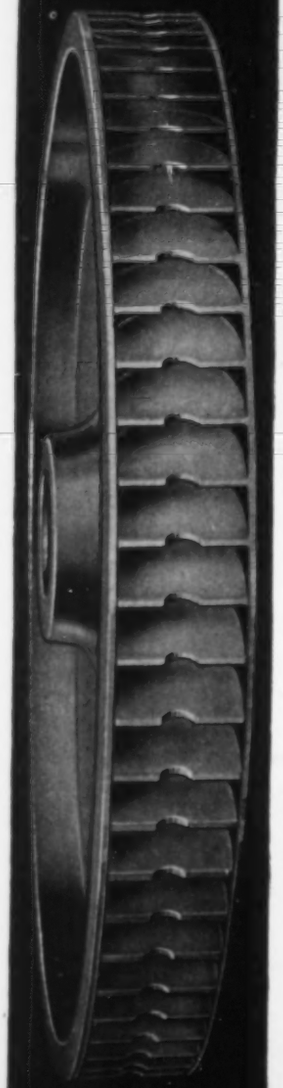


DIAGRAM SHOWING WHEEL CLEARANCES.

AA—Rim clearance, B—Large blade clearance, CC—Side clearance, (about one inch). Blades cannot foul, as they are protected by rims. Rubbing at AA will do no damage. Side clearance is so large that end-play from excessive external thrust cannot damage wheel.



ABOVE: 145 HP Terry Solid Wheel Turbine Direct Connected to Centrifugal Pump.



THESE LARGE WHEEL CLEARANCES INCREASE TERRY TURBINE DEPENDABILITY

In the Terry Wheel Turbine fine blade clearance is not essential to high operating efficiency. The actual clearance between the moving and stationary blades is greater than ⅛ inch. End play cannot affect this clearance and the side clearance is one inch or more. It is therefore not essential to make frequent adjustments of the thrust to maintain efficient and safe operation.

Clearance in the Terry blading may be reduced only by excessive wear of the main bearings, but even if this should occur, the projecting rims on the side of the wheel would rub on the smooth protecting surfaces of the reversing chamber, thereby automatically stopping the turbine before damage could result. Replacement of the interchangeable bearings immediately restores the original clearance.

T-1158

THE TERRY STEAM TURBINE COMPANY
TERRY SQUARE, HARTFORD, CONN.

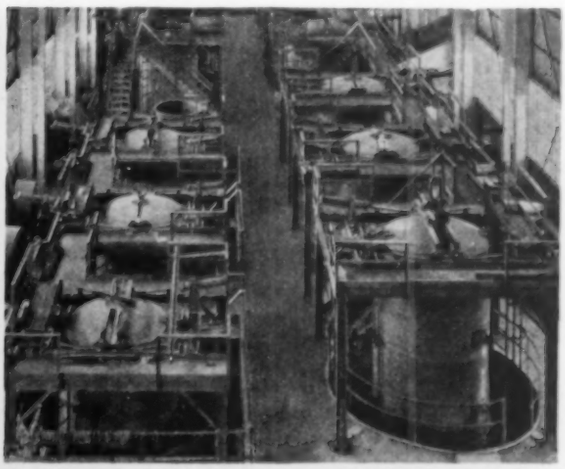
WHAT ABOUT THE *HEAT TREATING* IN THE STEEL *FORGINGS* YOU BUY?

The great testing ground of war emphasized the importance of correct heat treating in fortifying the performance value of heavy duty steel forgings. In the case of alloy steels, particularly, only by heat treatment can the full benefit of the alloy additions be fully realized. Suspension in vertical furnaces for long forgings provides uniform heating over the entire length and vertical quenching helps insure uniformity in the heat treated structure of the steel. Carefully prescribed heating cycles must be used. When forgings are annealed in horizontal furnaces they should be carefully protected from uneven heating to obtain complete heating uniformity. Are your forgings being treated with these advanced techniques?

Turbine Rotors must withstand high operating temperatures, without distortion, and consequently call for the "clean" steel making, expert forgesmithing and thorough heat treating that are standard practice at National Forge

NATIONAL FORGE USES MODERN HEAT TREATING FURNACES

Vertical furnaces capable of taking forgings up to 55 feet long are available. Also horizontal annealing furnaces for forgings up to 34 feet long. All these furnaces are provided with complete thermostat controls and automatic recording provides a permanent record of each operation. With these facilities National Forge can handle the heat treatment of highly important forgings in accordance with the latest approved methods. By years of experience National Forge has acquired the knowledge and skill necessary to successful heat treatment. To have your forgings properly treated, make sure they are National Forged.



NATIONAL FORGE & ORDNANCE COMPANY

IRVINE, WARREN COUNTY, PENNSYLVANIA

I-R STEAM-JET COOLERS

SUPPLY CHILLED WATER FOR POWDER MANUFACTURE

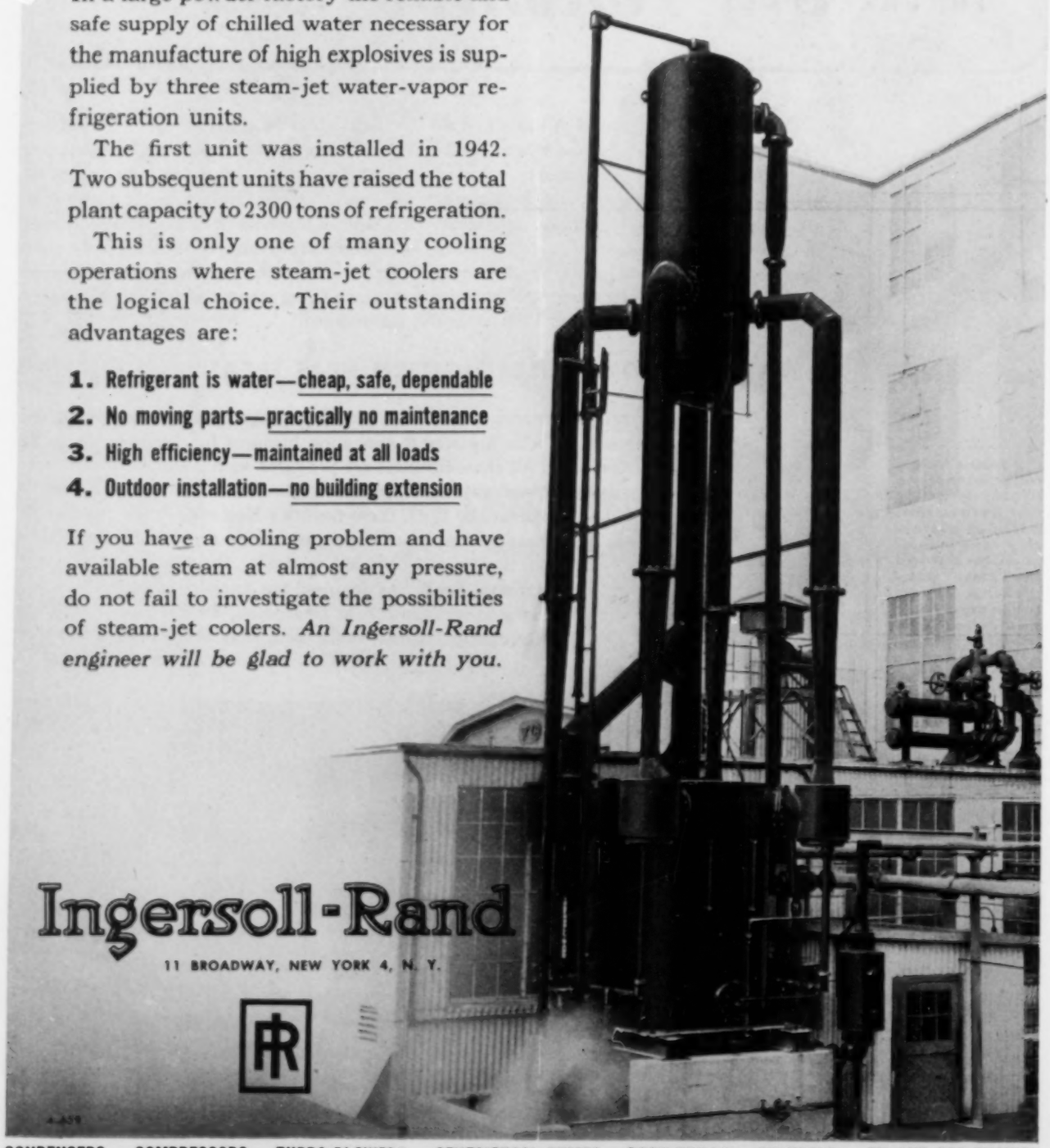
In a large powder factory the reliable and safe supply of chilled water necessary for the manufacture of high explosives is supplied by three steam-jet water-vapor refrigeration units.

The first unit was installed in 1942. Two subsequent units have raised the total plant capacity to 2300 tons of refrigeration.

This is only one of many cooling operations where steam-jet coolers are the logical choice. Their outstanding advantages are:

1. **Refrigerant is water—cheap, safe, dependable**
2. **No moving parts—practically no maintenance**
3. **High efficiency—maintained at all loads**
4. **Outdoor installation—no building extension**

If you have a cooling problem and have available steam at almost any pressure, do not fail to investigate the possibilities of steam-jet coolers. *An Ingersoll-Rand engineer will be glad to work with you.*

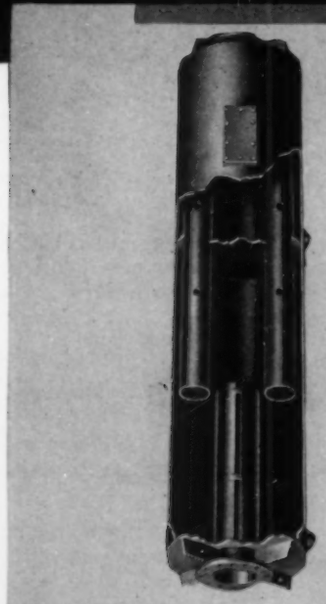


Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y.

CONDENSERS · COMPRESSORS · TURBO BLOWERS · CENTRIFUGAL PUMPS · ROCK DRILLS · AIR TOOLS · OIL AND GAS ENGINES

KILL ENGINE EXHAUST NOISE WITH MAXIM SILENCERS



Maxim Exhaust & Intake Silencers silence the exhaust or intake of internal combustion engines, steam engine exhaust, compressor intake, vacuum pump discharge and the intake or discharge of blowers of the positive pressure type. Spark arresting included where necessary.

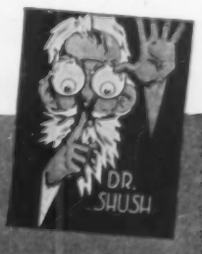
Adequate silencing of engine exhaust noise is an operating necessity today. The engines shown above could, without proper silencing, make a public disturbance that would quickly be felt by those in charge of plant operation. With Maxim Silencers, however, exhaust noise can be reduced to a point where it is scarcely audible.

Maxim engineers will be glad to recommend the correct silencing equipment to best meet your particular problem. Send your specifications to the address given below.

Maxim also makes Heat Recovery Silencers which combine efficient silencing, spark arresting, and the recovery of waste exhaust heat to produce steam or hot water for heating or processing operations. These are described in Heat Recovery Bulletins WH 100, WH 101 and WH 103.

WRITE FOR BULLETINS describing exhaust & intake silencers D 125, D 127, D 101, D 37.

THE MAXIM SILENCER CO. 61 HOMESTEAD AVE., HARTFORD, CONN.



ARMY ★★★ NAVY ★★

MAXIM

WHY ? Longer Ring Life Less Cylinder Wear

WITH COOK'S GRAPHITIC IRON RINGS

BECAUSE COOK'S GRAPHITIC IRON, the exclusive material of which COOK'S Rings are made, excels in wear resisting properties. Here are 4 reasons why—

1—GRAPHITE—An excess of carbon is present in COOK'S Graphitic Iron in the form of graphite flakes. This greasy substance eases the ring over dry spots in the cylinder. It also absorbs oil which further aids in eliminating cylinder scuffing.

2—POROSITY—The porous structure of COOK'S Graphitic Iron, assures better lubrication. The tiny pores and channels in its surface serve as reservoirs for lubricating oil, feeding it back to the surface as needed.

3—ABILITY TO WORK-HARDEN—COOK'S Graphitic Iron has rapid skin-forming ability that provides a glass-hard mirror-like surface which minimizes friction—prolongs life.

4—FREE OF CARBIDES—Steel-like inclusions (carbides) in ordinary ring materials tend to break down the cylinder surface, then drop out and act as an abrasive. This source of cylinder wear is eliminated with COOK'S Rings because COOK'S Graphitic Iron is free of such inclusions.

Constantly refined since first introduced over twenty years ago—COOK'S Rings have met with their greatest success in severe service units. If your post war developments require a superior ring, ask our engineers to study your problem. For existing equipment, address nearest office:

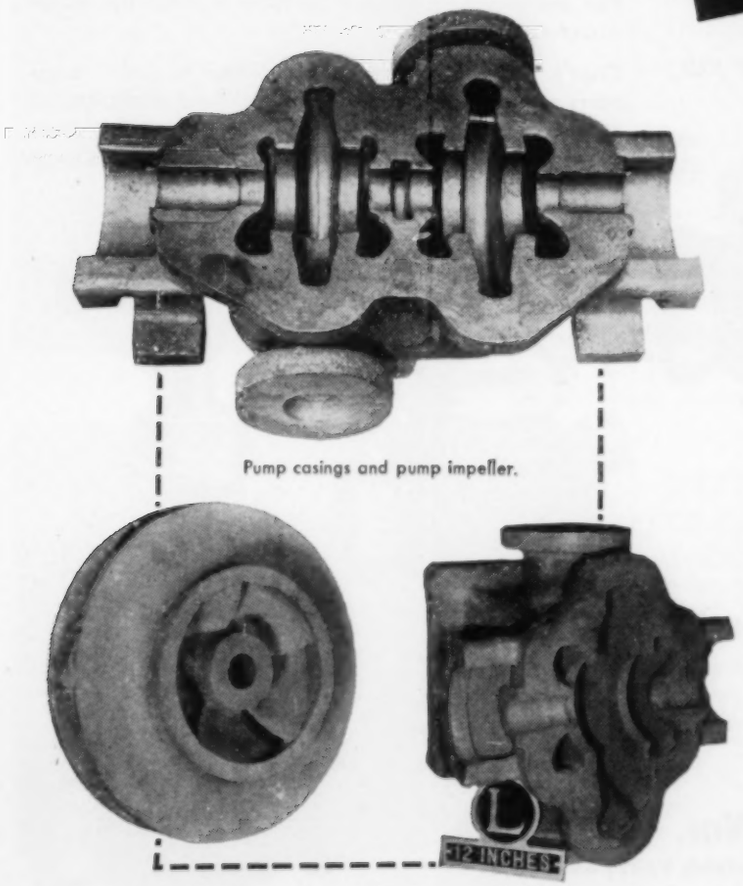
COOK'S GRAPHITIC IRON Piston Rings

C. LEE COOK MANUFACTURING CO.
INCORPORATED
LOUISVILLE, KENTUCKY

BALTIMORE • BOSTON • CHICAGO • CLEVELAND • HOUSTON • LOS ANGELES • MOBILE • NEW ORLEANS • NEW YORK • SAN FRANCISCO • TULSA

Guard Against These 4 "Killers" of Castings WITH LEBANON CIRCLE L 31

1. SULPHUROUS ACIDS
2. SULPHUR-BEARING ATMOSPHERES
3. CORROSIVE MINE WATERS
4. OXIDATION AT HIGH TEMPERATURES



Pump casings and pump impeller.

LEBANON CIRCLE Ⓛ 31

A 28% CHROMIUM, 10% NICKEL STAINLESS ALLOY

Nominal Physical Properties

Tensile Strength	83,000 lbs.
Yield Point	47,000 lbs.
Elongation in 2"	15%
Brinell Hardness	155

Complete data sheet sent free on request.

LEBANON CIRCLE Ⓛ 31 so thoroughly resists the action of corrosion and oxidation under certain service conditions that its use is clearly indicated wherever these conditions are encountered.

This 28% Chromium, 10% Nickel Stainless Alloy has earned a sound reputation for high resistance to sulphurous acids . . . sulphite liquors . . . and sulphuric acid combined with nitric acid. Circle Ⓛ 31 has also proved its ability to provide excellent resistance to sulphur-bearing atmospheres at high temperatures.

This Lebanon alloy affords outstanding protection against the highly corrosive waters of both anthracite and bituminous coal mines. Extreme resistance to oxidation at high temperatures is another valuable characteristic. Resistance ranges up to 1850° for continuous service and to 2000° for short periods.

Circle Ⓛ 31 is a favorite of the mining and paper industries for pump parts, valves and fittings. Lebanon foundry engineers and metallurgists will gladly survey its possibilities for you. Write today and tell us your service conditions.

LEBANON STEEL FOUNDRY **LEBANON, PA.**

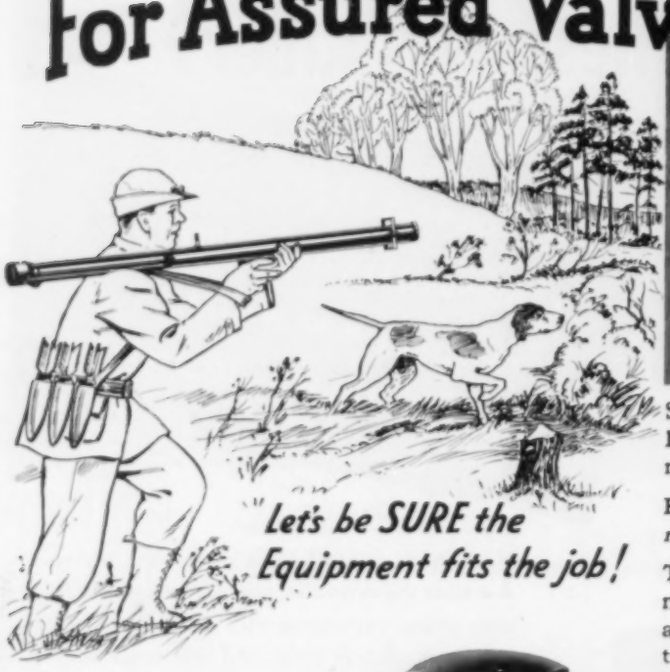
"In the Lebanon Valley"

ORIGINAL AMERICAN LICENSEE GEORGE FISCHER (SWISS CHAMOTTE) METHOD

Lebanon ALLOY AND STEEL Castings

For Assured Valve Performance

Consult POWELL ENGINEERING *first*



Shooting quail with a bazooka would be nonsensical. But trying to make a valve do a job for which it is not suited doesn't make much sense, either.

For assured performance in flow control the valve *must fit the job.*

That's why Powell maintains a staff of valve engineers who are always at your service for consultation and advice. And if you have any individual flow control problems, Powell Engineering is ready to design the correct valves to meet them.

Fig. 95—Bronze Dash Pot Check Valve for 200 pounds air working pressure. Designed for air compressor service. Has screwed ends, screwed cap, and regrindable, renewable wear-resisting bronze disc. Because of the cushioning effect of the plunger in the dash pot, the seating of the disc is practically noiseless.

Fig. 150—Bronze Globe Valve for 150 pounds W.S.P. Screwed ends, union bonnet and renewable vulcanized composition disc.

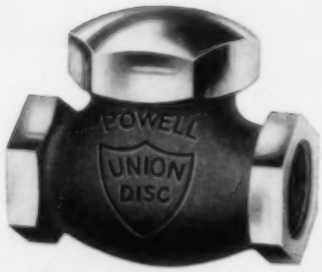


Fig. 158—Bronze Horizontal Lift Check Valve for 150 pounds W.S.P. Screwed ends, screwed cap and renewable vulcanized composition disc.

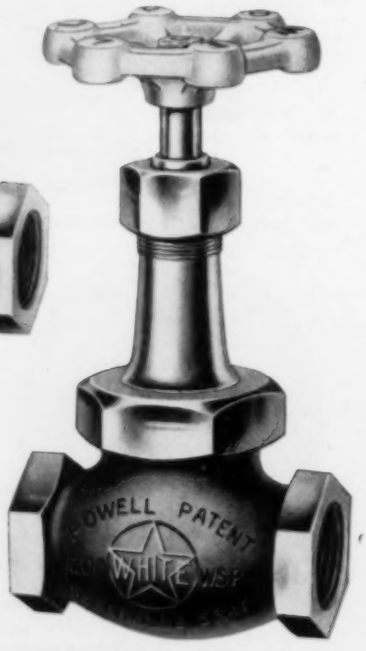


Fig. 1708—Bronze Globe Valve for 200 pounds W.S.P. Screwed ends, union bonnet, renewable seat and regrindable, renewable, wear-resisting "Powellium" nickel-bronze semi-cone, plug type disc.

The Wm. Powell Co.

Dependable Valves Since 1846

Cincinnati 22, Ohio

DISTRIBUTORS IN PRINCIPAL CITIES

POWELL VALVES

A WINNING PAIR

for Quarrying, Metal Mining, Construction

● This pair of modern explosives—Hercomite* and Gelamite* — will bring you maximum breakage per dollar of cost . . . a 10% to 15% saving as compared to older type explosives.

Users of Hercomite and Gelamite report satisfactory results for both surface and underground work. That's why Hercomite and Gelamite are more widely used today than ever before.

There is a strength and grade that will give greater efficiency and economy for almost every type of blasting. Write us for further information.

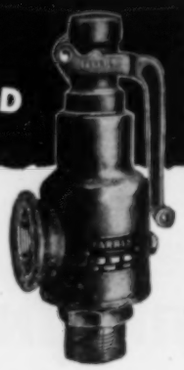
HERCULES

EXPLOSIVES DEPARTMENT
HERCULES POWDER COMPANY
INCORPORATED
932 KING STREET, WILMINGTON 99, DELAWARE

*Reg. U. S. Pat. Off. by Hercules Powder Company

XR-55

POPS when it SHOULD pop!



Accurate, dependable popping and tight closing are built into this FARRIS Pop Valve No. 1800. Precision machining of the same calibre that has made all FARRIS Safety and Relief Valves so reliable. Light-weight, but sturdy construction for grueling service and long life. Economically priced.

Specify this FARRIS pop valve and you'll soon see why engineers are demanding FARRIS valves for all kinds of safety and relief jobs. We build a complete line to suit most jobs.

Write today for our Specifications Bulletin.

Adjusted popping range, proven accurate and safe. For pressures to 250 lbs. steam. Sizes ½" to 2½".

FARRIS ENGINEERING CO., 354 Commercial Ave., Palisades Park, N. J.

Farris

SAFETY and RELIEF VALVES

UNIVERSAL Serves America's Leading Industries

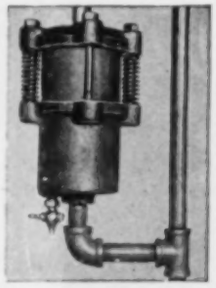
UNIVERSAL

Air FILTERS

for COMPRESSED AIR and GAS LINES

The "Original" Patented porous stone Airfilter with a remarkable record of performance

The Porous Stone *Insures*

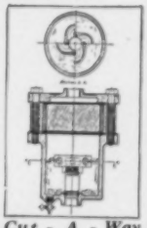


Pure, Dry, Oil-Free Compressed Air

For Process Work

Separates and traps condensed moisture, oil, pipe scale and all other impurities by means of centrifugal action of the air PLUS filtration through the minute pores of a synthetic stone. Thousands of satisfied users.

Write for illustrated Bulletin No. 301.



Cut - A - Way Diagram of Universal Filter

- Quick Change Filter Stone
- Two Stones with each Unit
- Long Life—Trouble Free
- Easily installed
- No moving parts

Universal Filter Co.

7021 Manchester
St. Louis, 17, Missouri

BUY ALL THREE FOR ONLY $6.00

or Any COMBINATION at PROPORTIONATE SAVINGS

COMPRESSED AIR DATA (Fifth Edition): 408 pages on the theory and practice of compressed-air engineering.

CAMERON HYDRAULIC DATA (Eleventh Edition): 240 pages on hydraulics, water data, miscellaneous liquids, steam data, electric data, and miscellaneous data.

CAMERON PUMP OPERATORS' DATA (First Edition): 170 pages of practical information for the man who installs, operates or services centrifugal pumps.

Fill out the coupon and mail it today. Be certain to check the group of books wanted.

PRICE INDIVIDUAL BOOKS PER COPY

Compressed Air Data.....$3.00
Cameron Hydraulic Data.....$3.00
Cameron Pump Operators Data.....$2.00

COMPRESSED AIR MAGAZINE, 942 Morris Street, Phillipsburg, New Jersey, U. S. A.

Please send me:

- ☐ Compressed Air Data, Cameron Hydraulic Data and Cameron Pump Operators' Data.....All three for $6.00.
- ☐ Compressed Air Data and Cameron Hydraulic Data.....Both books for $5.00.
- ☐ Cameron Hydraulic Data and Cameron Pump Operators' Data....Both books for $4.50.
- ☐ Compressed Air Data and Cameron Pump Operators' Data.....Both books for $4.50.
- ☐ Enclosed is (money order) (check) for $.....) ☐ Send books C.O.D. I understand that the books will be sent me postpaid, and that they may be returned within 10 days if not satisfactory.

Name .....

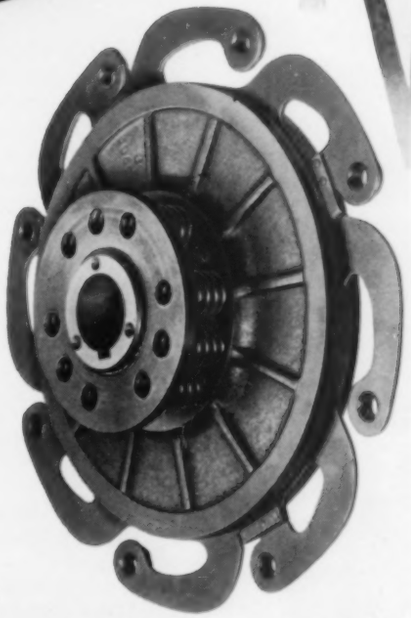
Company .....

Street No. .....

City .....State.....Country .....

IF THEY ALWAYS BUILT BRIDGES WIDE ENOUGH.....

. . . in the first place, there wouldn't be any need to break down a curb and widen the bridge to handle more traffic. Such needs can't always be foreseen, however, and when it becomes necessary to demolish concrete construction, *I-R* Paving Breakers and *Mobil-Air* Compressors equipped with *Flex-Disc* Clutches will make short work of it. *Flex-Disc* Clutches can be depended on for continuous service with practically no attention or maintenance.



I-R *Mobil-Air* Compressors are equipped with *Flex-Disc* Clutches — U. S. Patent Nos. 2,177,362 and 2,259,461 and others pending.

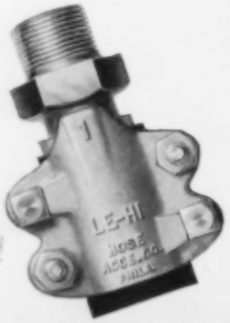
C. M. EASON, INDUSTRIAL CLUTCH CO.

Waukesha Wisconsin

There's NO PRESSURE DROP on HIGH PRESSURE LINES when LE-HI HOSE COUPLINGS ARE CARRYING THE LOAD

LE-HI Series 100 Universal Type Hose Couplings. Applicable for compressed air and many special uses where a quick detachable coupling is desirable.

LE-HI Series 400-W and G Female Washer or Ground Joint Type Coupling with I.P.T. Spud. Sizes ¾" and smaller furnished with two-bolt clamp and 1" and larger with four-bolt clamp.



LE-HI Series 500 Male Hose Coupling, companion unit for LE-HI Series 400-G and 400-W. It is completely adaptable to the widely diversified applications where the female units are used.

Ever stop to think how much it costs you every time your compressor runs full time . . . without cutting in and out?

Compressors and other primary equipment have to work "overtime" too often because of leaks caused by faulty hose couplings and fittings. Guard against pressure drop and loss of expensive power by using LE-HI Hose Couplings on your hose lines. Put the wear and tear on LE-HI . . . not on the equipment that costs thousands of dollars.

For example, on air compressors, pile driving equipment, road pumps, jetting pumps, and other hydraulic equipment, or for conveying air or steam under high pressure, specify LE-HI Series 400 and 500 Hose Couplings. Powerful clamps grip the coupling securely to the hose so that it will not leak or blow off.

Avoid pressure losses and costly shut downs. Specify LE-HI . . . a diversified line of hose couplings for industrial and construction use.

Sold Only
THROUGH DISTRIBUTORS

HOSE ACCESSORIES CO.
2716 North 17th Street, Phila. 32, Pa.

LE-HI HIGH and LOW PRESSURE HOSE COUPLINGS

THIS IS THE MURPHY TYPE A SEPARATOR ★ GUARANTEED

Pipe Sizes ½" to 4"
1 ½" to 4" Made in Steel

YES...

Guaranteed to remove all moisture from compressed air lines, and guaranteed against mechanical defects for a period of two years. Entirely mechanical and automatic. No absorbents or chemicals. No attention . . . No wear.

LITERATURE AND PRICES ON REQUEST.

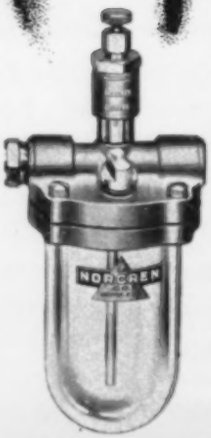
Murphy *knows* compressed air. Write for our literature, or state your problem. Our engineers are at your service.

GUARANTEED COMPRESSED AIR PRODUCTS

AFTERCOOLERS • SEPARATORS • STRAINERS • TRAPS
SPRAY GUNS • PISTOL SPRAYERS

JAS. A. MURPHY & CO.
HAMILTON, OHIO, U.S.A.
Moisture Elimination Up To 3000 Pounds Per Square Inch

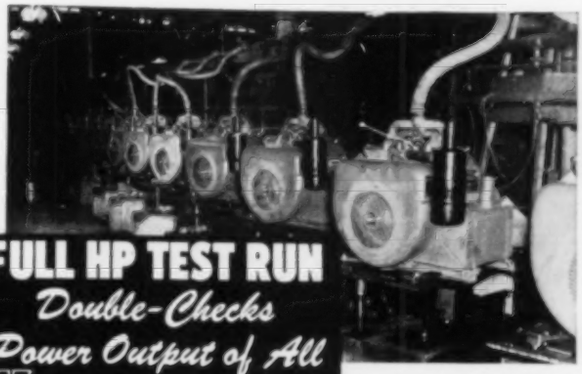
PROTECTED by... FOG



Norgren Lubricators in the air lines protect your air driven tools and cylinders from costly repairs, with "air-borne" lubrication. Automatically inject exactly the right amount of oil into the air stream, creating an "oil fog" that travels with the air. This lubricates ALL moving parts when the tool is working. Prevents rust and corrosion when the tool is idle. Pays for itself *in a hurry!*

Write C. A. Norgren Co., 220 Santa Fe Drive, Denver 9, Colorado.

Norgren



FULL HP TEST RUN
Double-Checks Power Output of All
WISCONSIN *Air-Cooled* Engines

Every 4-cylinder V-type Wisconsin Engine, as well as all single cylinder engines from the smallest to the largest, are put on a 4-hour test run (the last hour under full load), working against a specially designed water brake.

This not only serves as an operating check on power output, but also provides a valuable *functional pre-test* of every working part . . . because no engine is any better than its smallest individual part, nor all of the parts working together in perfect mechanical coordination.

All this is important in relation to the work these engines may be called upon to do when *powering your equipment.*

Most H.P. per pound

WISCONSIN MOTOR Corporation
MILWAUKEE 14, WISCONSIN, U. S. A.
World's Largest Builders of Heavy-Duty Air-Cooled Engines

Here's Money-Saving Protection For Your Compressed Air Operated Machinery and Instruments

Now, regardless of volumes required or fluctuating pressures, the new Bird-White Pur-O-fiers completely and effectively remove all moisture, oil, dirt and other foreign matter from compressed air or gas lines—preventing costly corrosion and gumming in compressed air-operated machinery and instruments.

Operating on the principle of centrifugal action, a high speed Turbo-rotor forces the tiny particles of foreign matter outward where they are trapped and drained off.

Single units can accommodate up to 100 cubic feet. Above this range multiple units are recommended.

New applications for Bird-White Pur-O-fiers are being developed every day. Write for Bulletin No. 10 giving complete information.

BIRD-WHITE COMPANY
Dept. CA
3119 West Lake Street
Chicago 12, Illinois

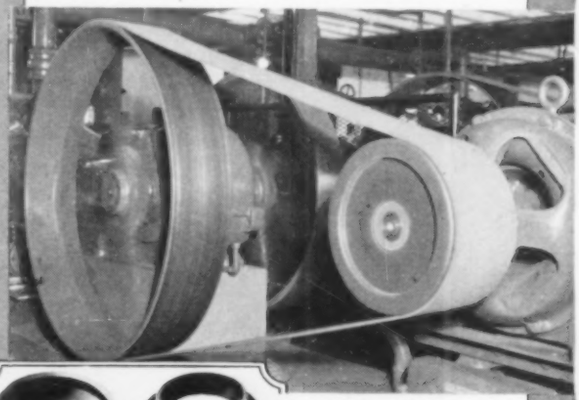
PATENTED

---

for Greater
COMPRESSOR CAPACITY
use
SCHIEREN
FLAT LEATHER BELTING

For better pulling grip and the least slip, nothing surpasses SCHIEREN FLAT LEATHER BELTING. And that means no decrease in compressor capacity no matter what load changes come. SCHIEREN LEATHER BELTING combined with the the constant, automatic, correct tension of pivoted motor bases on short centers assures maintenance-free power delivery. Write for full information and our estimate on your next drive. There's no obligation to order.

National Distributors of Rockwood Bases



SCHIEREN QUALITY LEATHER PACKINGS

For every usual and unusual requirement, Schieren Leather Packings give you lower annual packing cost and high production efficiency. Send for catalog.

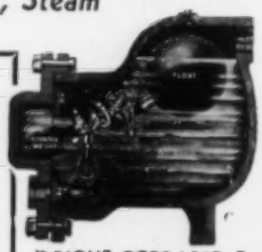
CHAS. A. SCHIEREN CO.
LEATHER BELTINGS • SPECIALTIES
HYDRAULIC PACKINGS
30 FERRY STREET, NEW YORK 7, N. Y.
60 FRONT STREET, WEST, TORONTO, ONTARIO

NICHOLSON TRAPS

For Air, Gas, Steam

FEATURE

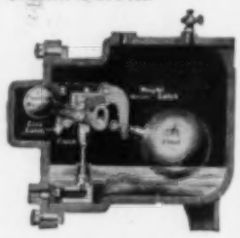
STAINLESS STEEL where it counts



WEIGHT-OPERATED Trap' model JR. For air, gas, steam pressures to 200 lbs.

While Nicholson Traps embody exclusive engineering features that furnish enormous discharge capacity, they are equally well-known for their "trouble-free long wear"--resulting from the generous use of stainless steel, wherever it counts. For more details send for..

Catalog 444



MODEL WO. Air, gasoline pressures to 650 lbs.; steam to 500 lbs.

W. H. NICHOLSON & CO.

180 OREGON ST., WILEKS-BARRE, PA.

Valves ★ Traps ★ Steam Specialities

VACUUM PUMPS

Ingersoll-Rand Type 30 vacuum pumps have proven their worth on dry vacuum service. They are small, compact, vertical, single-acting, air-cooled machines of the single- and two-stage types. Available in capacities from 9 to 100 cfm for vacuums up to 29" hg.

Larger reciprocating vacuum pumps for capacities up to 8400 cfm, as well as a complete line of steam-jet vacuum pumps are also manufactured by the Company.

Ingersoll-Rand

11 Broadway, New York 4, N. Y.

3-663

"WORK MANIPULATORS"

Ride on NOPAK Air Hoists!

ENABLE WOMEN OPERATORS TO HANDLE HEAVY FORGINGS Easily!

1 Forging being gripped by manipulator.

2 Forging raised and turned to horizontal position for machining.

3 Forging returned to vertical position before lowering.

4 Forging being released in vertical position.

60 of these Work Manipulators, built by Engineering Products Co., Los Angeles, Calif., served to speed up rocket production for the Navy, at the Rheem Mfg. Co., Las Vegas, Nev.

The Work Manipulator consists of a swivel-action, clamping device mounted in a jaw-like frame and attached to the piston rod of a NOPAK AIR HOIST suspended from an overhead trolley. The hoist consists of a NOPAK Model E Air Cylinder, 2" in diameter with 30" stroke. A ⅜" NOPAK 4-Way Valve, equipped with cross bar and pull chains with spring return to vertical shut-off, is mounted on the cylinder.

The air-powered hoist raises the forgings and enables the operator to swing them into proper position for each succeeding operation. The pictures may suggest similar time and labor saving uses for a NOPAK Air Hoist in your production or assembly operations.

NOPAK

VALVES AND CYLINDERS

DESIGNED for AIR and HYDRAULIC SERVICE

GALLAND-HENNING MFG. CO.

2759 S. 31st Street

Milwaukee 7, Wisconsin

A 4916-½HA

Keeping railroad track constantly in condition to carry the heaviest and fastest trains safely is greatly facilitated by the use of specially-designed portable air compressors such as those shown in the photograph. They furnish dependable, economical air power for tie tampers, spike drivers, wrenches and other modern track maintenance tools.

These Ingersoll-Rand 16-tool Crawl-Air Compressors—like other types of compressors made by Ingersoll-Rand—are equipped with Timken Tapered Roller Bearings on the compressor crank shafts. This assures smooth operation; conserves power; protects the crank shafts against radial, thrust and combined loads; holds the shafts in alignment under all operating loads; and reduces upkeep time.

You'll get better performance from your new section motor cars and trailers too if they are Timken Bearing Equipped; all the leading makes are. Look for the trade-mark "TIMKEN" on every tapered roller bearing that goes in your equipment. The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

FOR AIR COMPRESSORS

class 9213AH3

PRESSURE SWITCH

200 lbs. pressure limit
15 to 40 lbs. differential

• A two-pole device for intermediate-sized motors. Simply-designed, huskily-built mechanism delivers long life and trouble-free operation with a minimum of servicing.

Quickly wired. Range and differential easily adjusted in the field. Offered with or without pressure-release valve for easier motor starting.

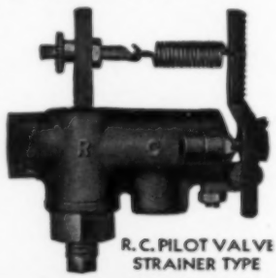
Write for Catalog • photos, specifications of Square D pressure switches and related devices. Address Square D Regulator Division, 6060 Rivard Street, Detroit 11, Michigan.

SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES

R. C. PILOT VALVES FOR POSITIVE CONTROL

R-C Unloader Pilot Valves (plain or strainer type) are standard on many leading compressors . . . installed as replacements on thousands of compressors in all parts of the U. S. A. and overseas. The R-C valve—positive in action—cannot chatter . . . it's always in open or closed position. Adjustment is provided for any unload-to-load range from 3% to 30% of maximum receiver pressure. Install an R-C Unloader Pilot valve—let performance prove its value. Specify air pressure and range of on-and-off operation desired. Write for price and recommendation.

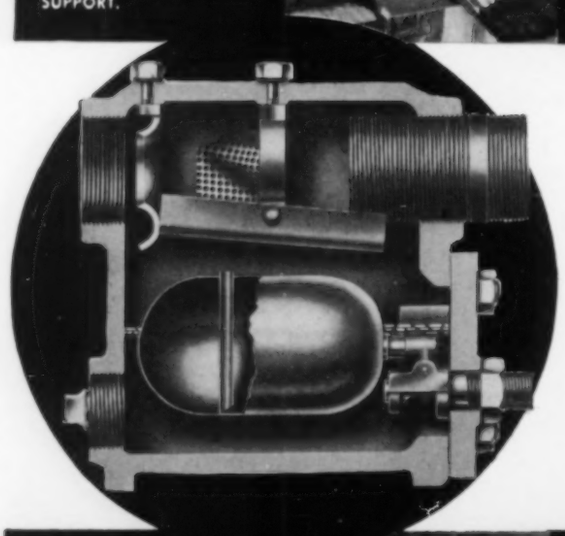


R. C. PILOT VALVE STRAINER TYPE

R. CONRADER CO.
1207 FRENCH STREET - ERIE, PA.
PILOT VALVES for Portable and Stationary Air Compressors provided with Unloaders

DRI AIR MAY BE INSTALLED BY SUSPENDING IT FROM THE PIPING WITHOUT ANY OTHER SUPPORT.

INCREASED PNEUMATIC EFFICIENCY WITH THIS AUTOMATIC SEPARATOR



PROTECT EQUIPMENT WITH

DRIAIR

SEPARATES • COLLECTS • DELIVERS

• DriAir separates and automatically ejects the condensed water and oil from compressed air lines, collects pipe scale and rust, delivers clean dry air to tools and other pneumatic equipment. This promotes better lubrication, reduces wear, increases life of tools and produces greater output. All internal parts are made of bronze or copper—resistant to corrosion and practically permanent.

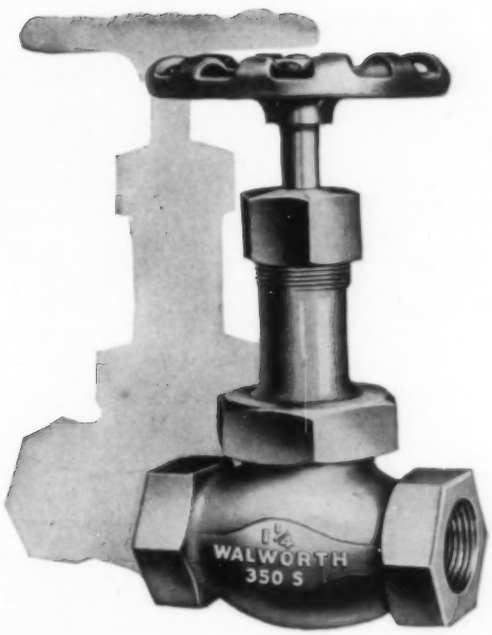
A TYPICAL INSTALLATION SHOWING DRI AIR STANDING ON A CONCRETE FLOOR NEXT TO THE WALL.

WRITE FOR BULLETIN DA WHICH FULLY DESCRIBES THE CONSTRUCTION AND OPERATION OF THE DRIAIR.

NEW JERSEY METER CO.

"SPECIALISTS IN COMPRESSED AIR DEVICES"

PLAINFIELD, NEW JERSEY



...the WALWORTH

No. 225P

The Toughest Bronze Valve your money can buy

THE stainless steel, non-corrosive seats and discs of the Walworth Number 225P are heat treated to a hardness of 500 Brinell — hard enough to scratch glass and crush nails.

Because of this extreme hardness the valve is tough enough to be closed on sand, slag, scale, and similar flotage without injury to the seating surfaces, and "wire drawing" is practically eliminated. Even after years of severe service Number 225P will assure tight, positive shut-off.

Union bonnet type construction, plug-type seats and discs, deep stuffing boxes, oversize stems and sturdy bronze bodies assure maximum protection against wear and leakage. Valves may be repacked under pressure, when fully opened. Available in both globe and angle types (angle Type No. 227P) in sizes ¼" to 2", this quality valve is recommended for 350 lbs. superheated steam pressure, maximum temperature 550F, and 1000 lbs. non-shock service on cold water, oil, gas or air.

For further information on this long-life, economical Walworth Bronze Valve see your nearby Walworth distributor, or write for Catalog No. 42.

Walworth VALVES AND FITTINGS

60 EAST 42nd STREET, NEW YORK 17, N. Y.

A THRILL PACKED ROLLER COASTER IS SAFER NOW

because

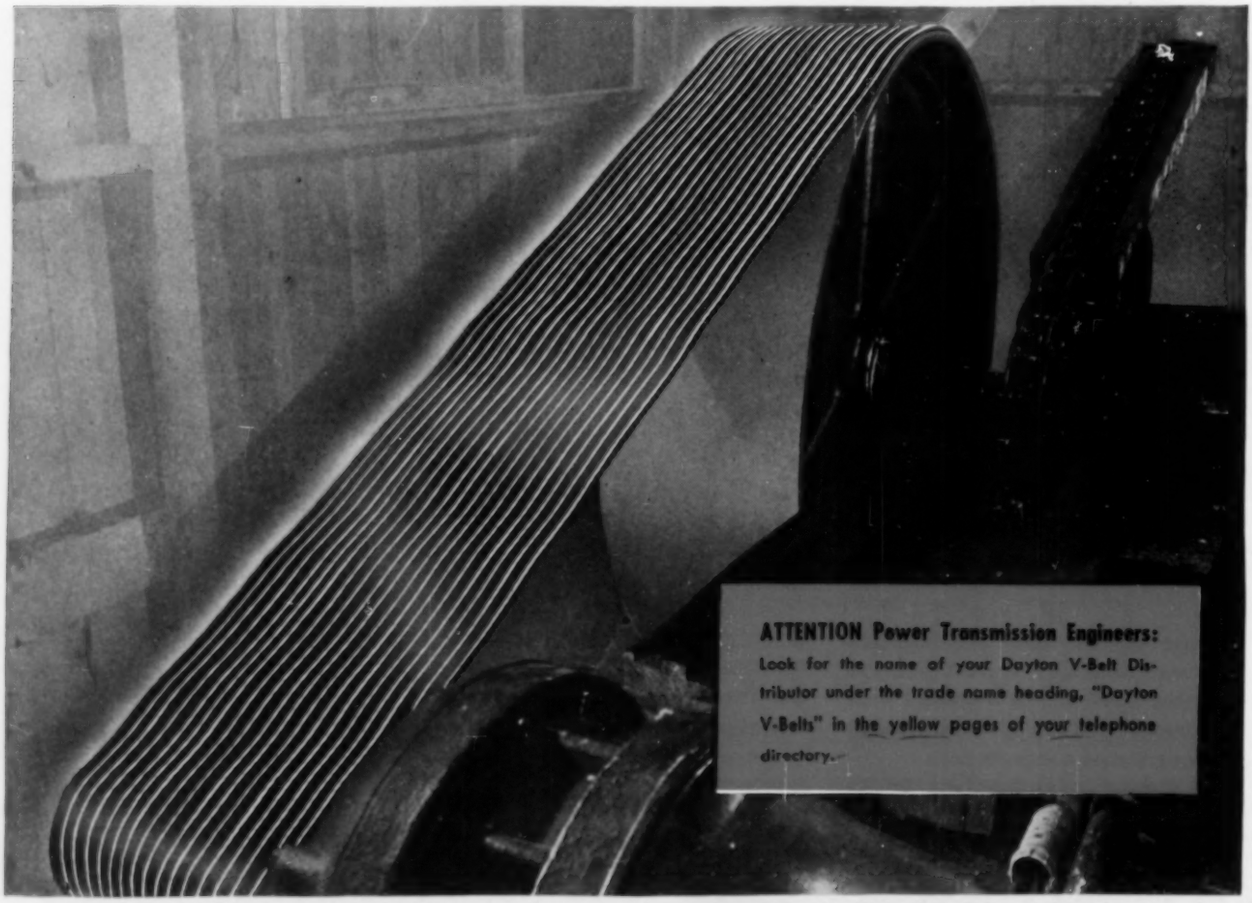
THE MACHINERY THAT STARTS THE CARS ON THEIR DIZZY TRIPS IS NOW EQUIPPED WITH

DAYTON V-BELT DRIVES

that ELIMINATE VIBRATION

The original drive on this roller coaster's machinery caused so much vibration that parts loosened rapidly, wore out quickly, creating a safety hazard as well as keeping maintenance costs high. Since Dayton V-Belts were installed, vibration has been eliminated, the safety hazard has disappeared and maintenance costs have been cut in half. In thousands of industrial plants Dayton V-Belt Drives are eliminating vibration and reducing maintenance costs and, in addition, are eliminating slippage and noise, saving space, providing positive power control and operating under the toughest conditions. They can do these things because they are *engineered* for their jobs . . . the result of a research experience of 40 years working with natural and synthetic rubbers, making *specialized* rubber products for specific industrial jobs. This is why Dayton V-Belts can solve your power transmission problems. Write for full information.

THE DAYTON RUBBER MANUFACTURING COMPANY
Dayton 1, Ohio


ATTENTION Power Transmission Engineers:
Look for the name of your Dayton V-Belt Distributor under the trade name heading, "Dayton V-Belts" in the yellow pages of your telephone directory.

SEND FOR THE LATEST DAYTON V-BELT CATALOG

This 384-page book gives complete engineering data and tables for figuring any power transmission drive quickly and easily. Your copy is FREE. Write today, The Dayton Rubber Manufacturing Company, Dayton 1, Ohio.

Dayton Rubber

THE WORLD'S LARGEST MANUFACTURER OF V-BELTS

"I see by the paper..."

Current events . . . industrial news . . . local gossip . . . politics . . . each day the world is literally laid at our doorstep, on paper.

Paper, in its many forms, is the key to our modern way of life . . . it aids in the advance of our business, science, culture and religion, and records their achievements . . . it conveys our personal and business messages . . . it protects our foods and other goods. Paper is inextricably woven into the structure of our civilization.

In every phase of paper manufacture, pumps are essential . . . sturdy pumps that will stay on the job . . . pumps for general service, boiler feed, mill supply . . . pumps for acid, milk of lime, caustic soda, black liquor, white liquor . . . pumps for paper stock.

Air power and vacuum equipment, too, play important parts in this production . . . air compressors and turboblowers . . . air tools . . . vacuum pumps . . . steam jet ejectors . . . surface and barometric condensers.

Such are the types of important machinery supplied by Ingersoll-Rand to pulp and paper mills, and many other industries. I-R engineers will gladly consult with you.

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y.

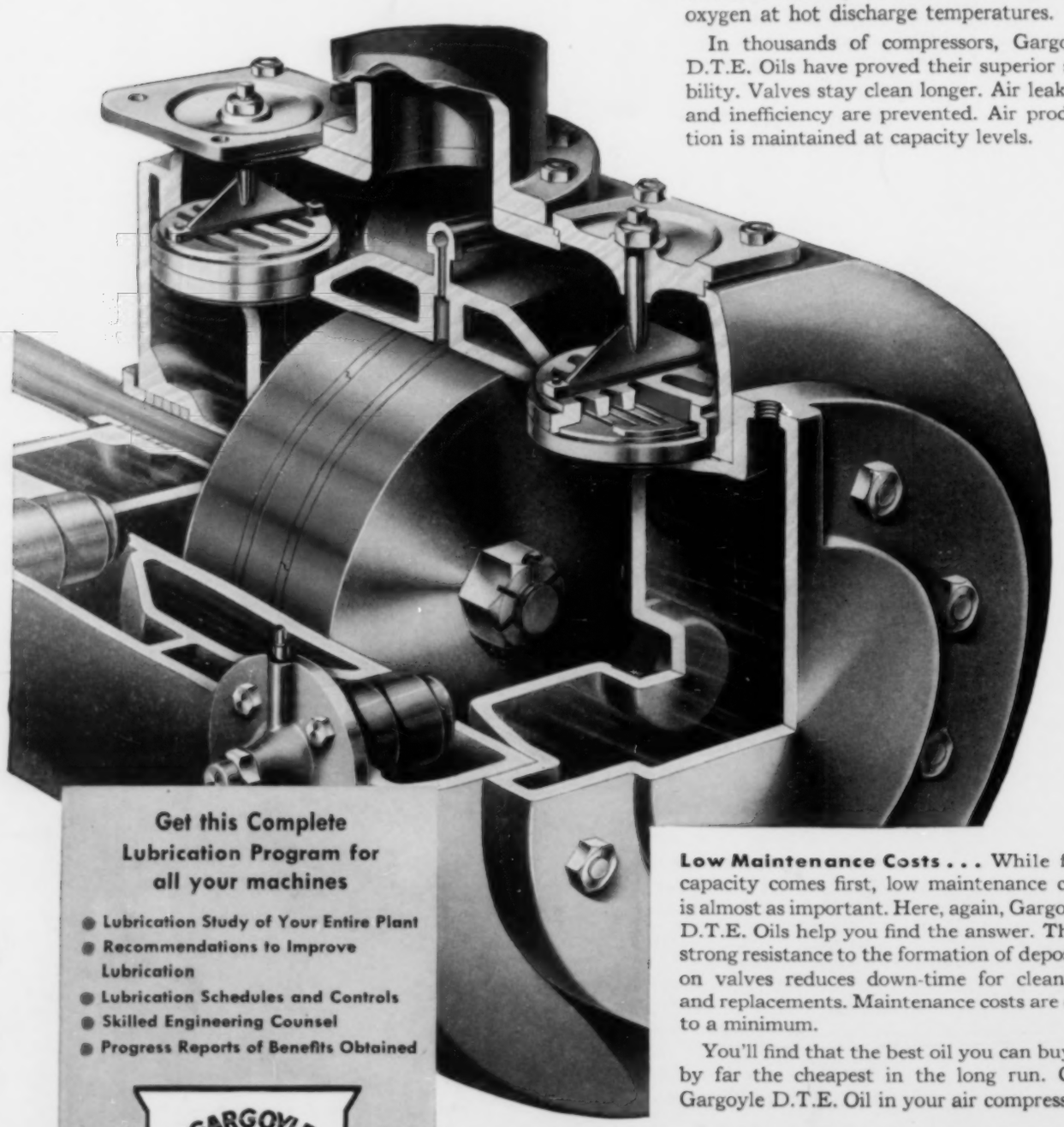
14-657

COMPRESSORS · CONDENSERS · TURBO BLOWERS · CENTRIFUGAL PUMPS · ROCK DRILLS · AIR TOOLS · OIL AND GAS ENGINES

What do you expect from your Compressor?

Continuous Full Power . . . For maximum efficiency, your air compressor valves must stay free from clogging oxidation deposits. This calls for a compressor oil with high chemical stability to resist the attacks of oxygen at hot discharge temperatures.

In thousands of compressors, Gargoyle D.T.E. Oils have proved their superior stability. Valves stay clean longer. Air leakage and inefficiency are prevented. Air production is maintained at capacity levels.



Low Maintenance Costs . . . While full capacity comes first, low maintenance cost is almost as important. Here, again, Gargoyle D.T.E. Oils help you find the answer. Their strong resistance to the formation of deposits on valves reduces down-time for cleaning and replacements. Maintenance costs are cut to a minimum.

You'll find that the best oil you can buy is by far the cheapest in the long run. Get Gargoyle D.T.E. Oil in your air compressor.

Get this Complete Lubrication Program for all your machines

- Lubrication Study of Your Entire Plant
- Recommendations to Improve Lubrication
- Lubrication Schedules and Controls
- Skilled Engineering Counsel
- Progress Reports of Benefits Obtained

GARGOYLE Lubricants

Socony-Vacuum Oil Company, Inc.

and Affiliates: Magnolia Petroleum Co., General Petroleum Corp. of Calif.

Tune in "Information Please"—Monday Evenings, 9:30 E.S.T.—NBC